GAS

JANUARY, 1949

ENGINEERING • UTILIZATION • LOAD-BUILDING • MANAGEMENT

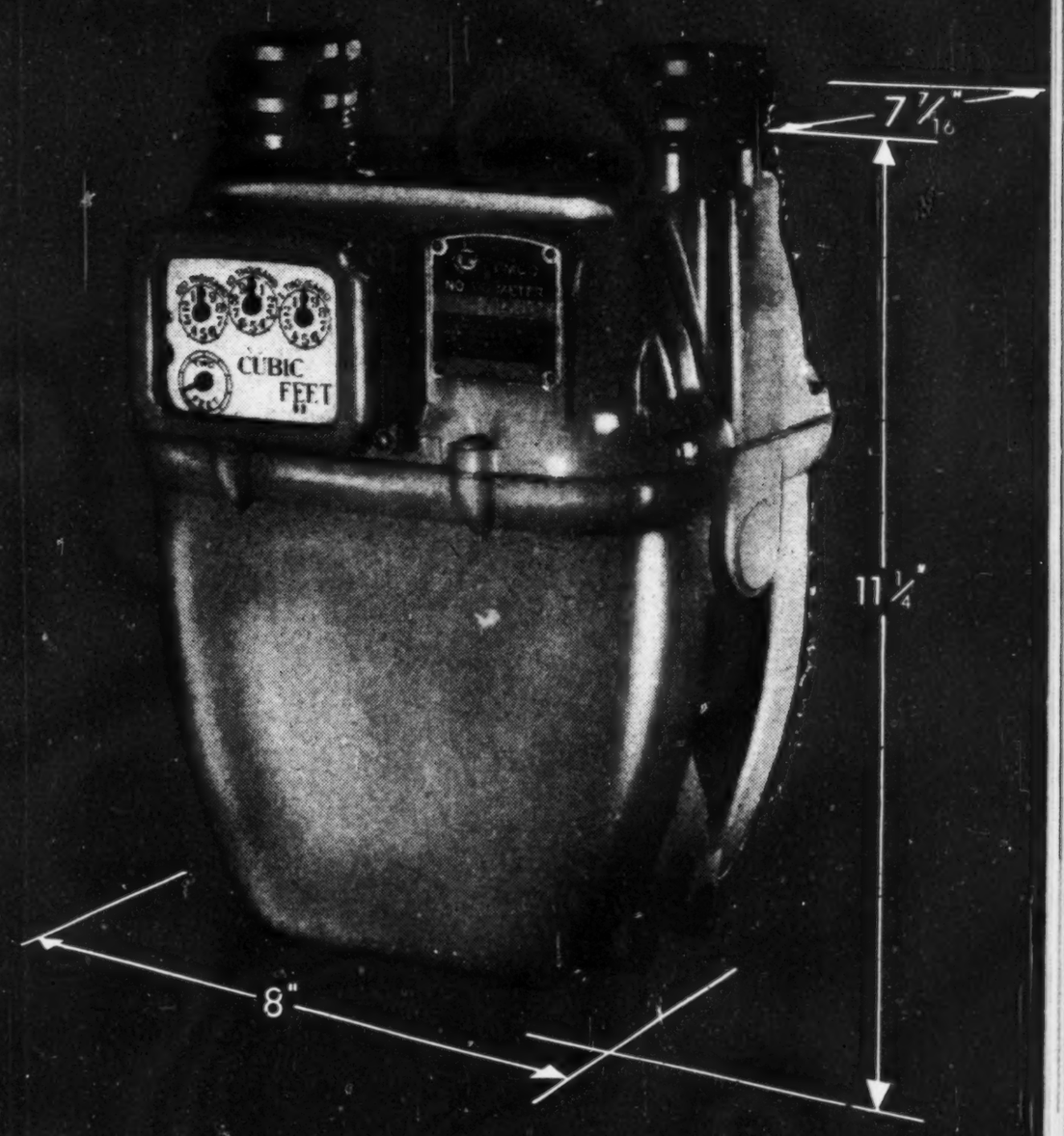
FOR NATURAL AND MANUFACTURED GAS

ENGINEERING LIBRARY

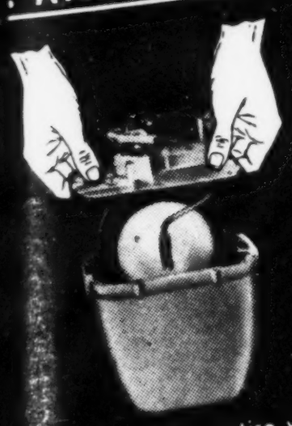
NEW ROCKWELL-EMCO No. 00 Gas Meter

WITH PRESSURE CAST ALUMINUM ALLOY CASE

This meter is smaller and lighter in weight than any other design. It is attractively housed in a smooth casing of pressure cast aluminum alloy; durable and non-corrosive. It may be quickly and economically repaired. And it has ample capacity for most domestic settings other than those of consumers drawing large central heating loads. To get full details on the *little* meter that's the *big* buy, write for bulletin 1163.



. . . AND THERE'S A NEW, SIMPLIFIED REPAIR PLAN



Showing how entire working mechanism lifts from meter case for economical unit replacement. A screw driver is the only tool required to make this switch.

Emco alone offers the repair ease and convenience of unit replacement of working parts. After a period of years the entire mechanism can be renewed by simply inserting a factory-fresh valve plate assembly in the old meter body. This feature speeds meter maintenance. It is particularly valuable to utilities having limited repair facilities.

ROCKWELL

QUICK FACTS...

AMPLE CAPACITY—The No. 00 has a capacity rating of 150 cfh at ½ in. pressure drop when measuring gas of 0.60 sp. gr.

LIGHT WEIGHT—Meter weighs only ¼ to ½ that of other meters having comparable capacity. It is easy to handle, stacks and stores conveniently, is economical to ship.

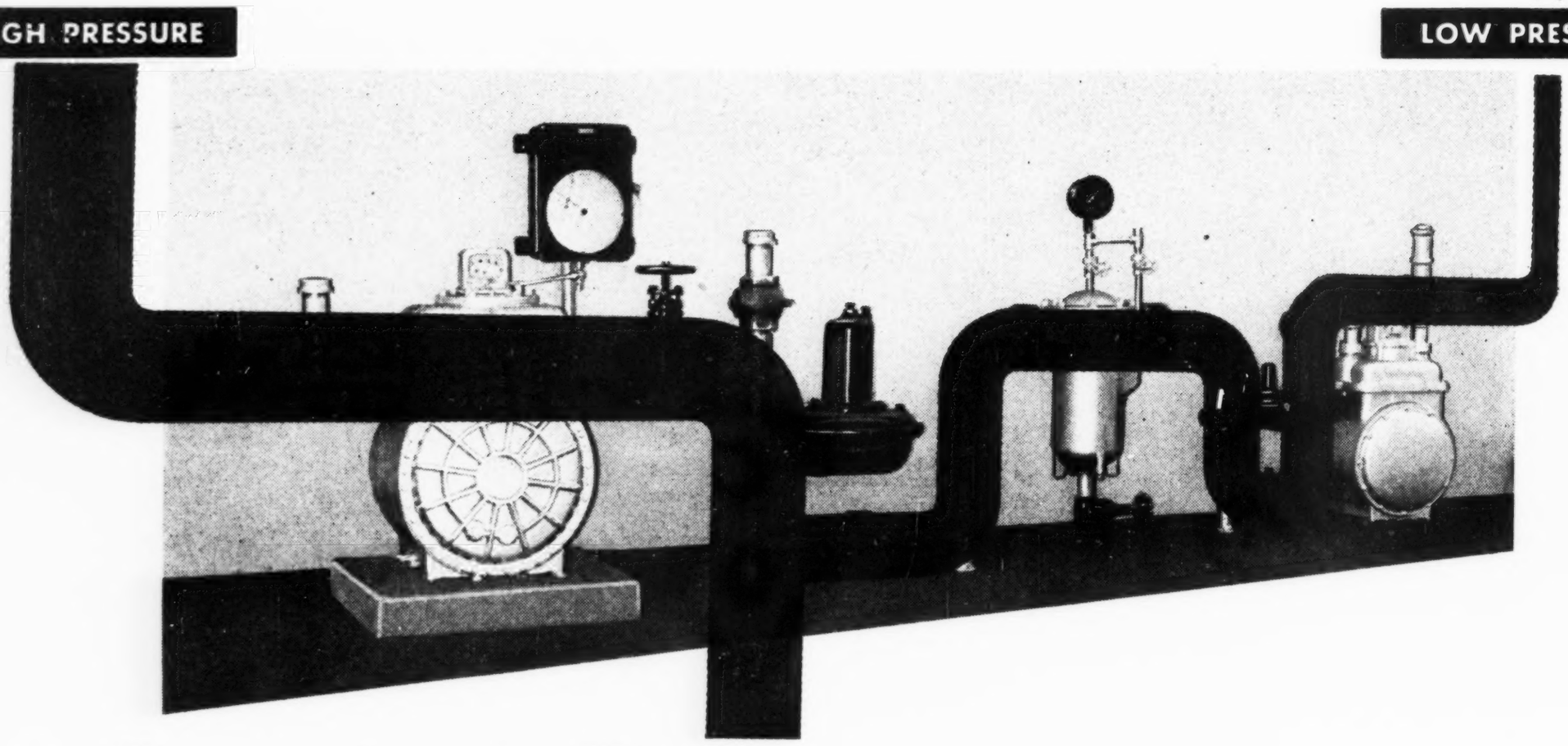
ADAPTABLE—Can be furnished with suitable connections to interchange with all makes of domestic meters as well as tin meter bars. Also available with ½" female thread side connections for use with LP-gas.

PROVEN DESIGN—Constructed around the time-proven Emco pattern with removable valve plate carrying all working parts.

ROCKWELL MANUFACTURING COMPANY
METER DIVISION
PITTSBURGH 8, PA.

HIGH PRESSURE

LOW PRESSURE



Constant Balance

through precision gas regulation

Reliance Regulators maintain round the clock control of gas pressure in this installation.

From a single high pressure source of gas two different pressures are used in this plant. Millions of B.T.U.s are needed for furnaces where only thousands are needed for hot water heaters and laboratory use.

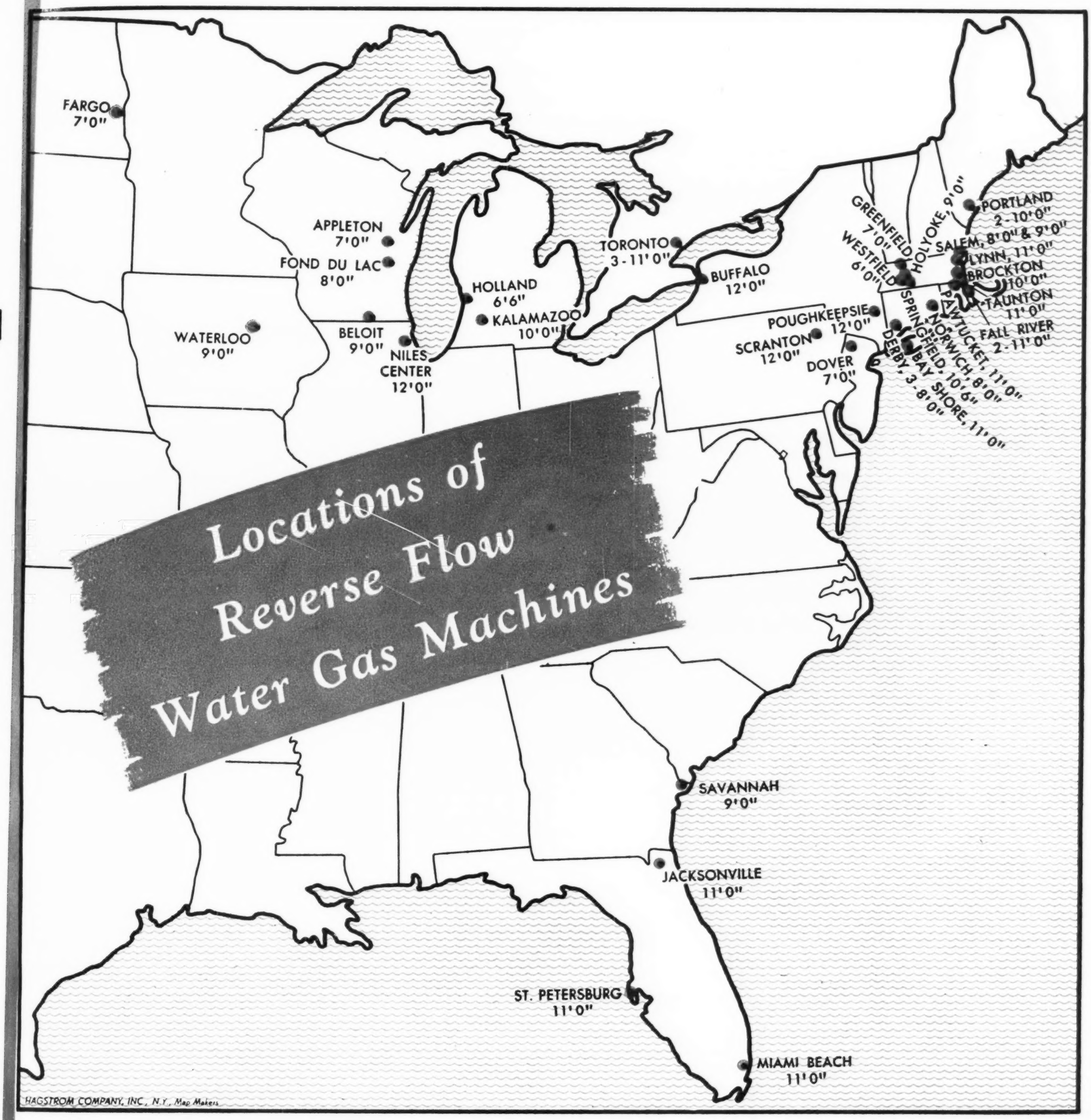
Natural gas is supplied at two fixed pressures throughout the plant, regardless of the variable volumetric demand at different times of the day. Reliance Regulators maintain a *constant balance* of these required pressures in each line before the gas is metered through separate meters.

Regardless of the pressure differential and volumetric needs involved, we can provide you with perfect gas regulation.

Write today!
Bulletins on all types of
Reliance Regulators and
Filters are available.

AMERICAN METERS

RELIANCE REGULATORS



IN THE LAST twelve years since Semet-Solvay introduced the Reverse Flow principle of Water Gas manufacture, the gas industry has given it an ever increasing acceptance. The map of installations provides a graphic illustration of this. Thirty-six machines varying in size from 6′ 00″ to 12′ 00″ have been contracted for erection in as diverse locations as Miami Beach, Florida, Portland, Maine, and Fargo, North Dakota. At the present time construction is in progress or about to be started on five sets.

We invite inquiries on operating data, particularly with reference to machines in which the latest automatic features have been incorporated.

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GAS

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Twenty-Fifth Year of Publication

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PUBLICATION OFFICE

198 SOUTH ALVARADO STREET, LOS ANGELES 4, CALIFORNIA • Phone: DREXEL 4337

BRANCH OFFICES

CHICAGO, DAVID CARMEN, Manager, 1064 Peoples Gas Building, WABash 2589
NEW YORK, JOSEPH M. DEMATTHEW, Manager, 11 West 42nd St., CHickering 4-1969
DALLAS, ROBERT B. FARSON, Manager, 2411 Nicholson Drive, YAle 2-9455
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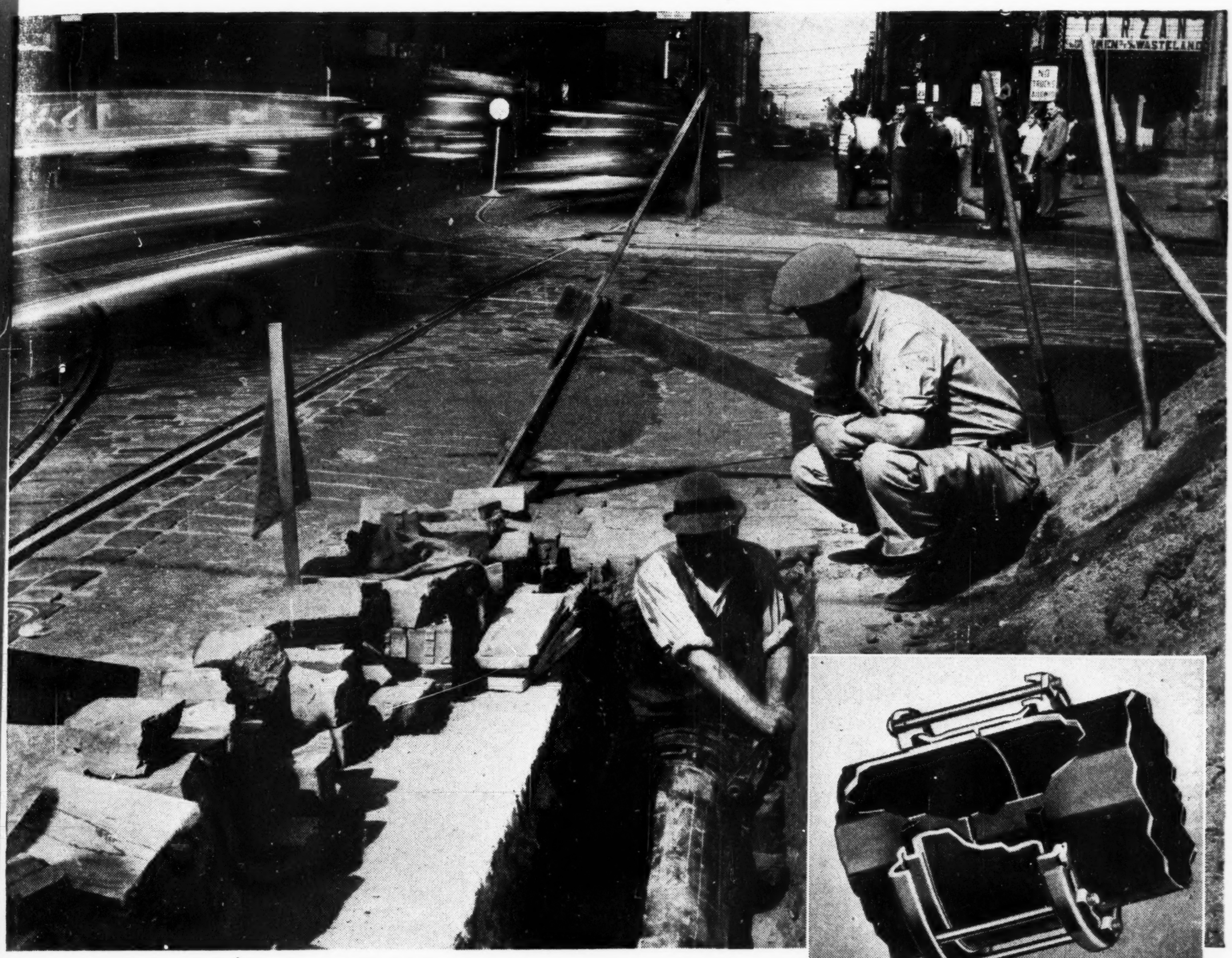

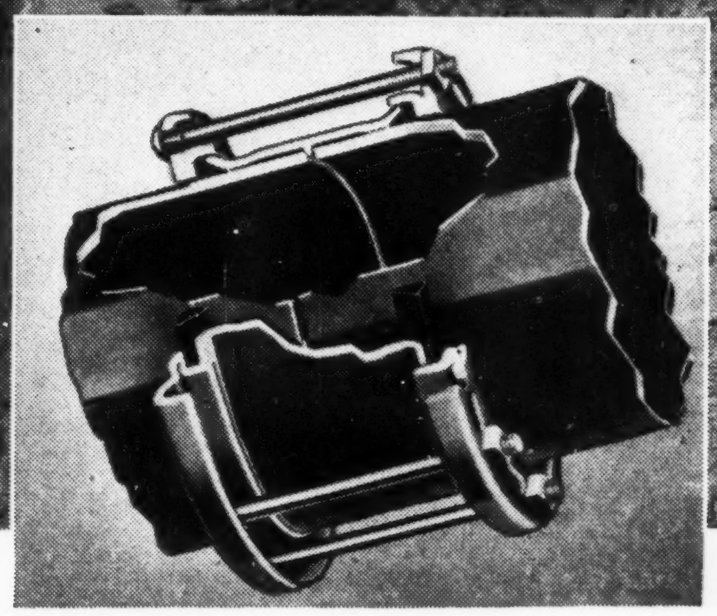

TRAFFIC AS USUAL DURING CONSTRUCTION

Problem: *To install a gas line under a city's busiest intersection with minimum interference to traffic. Line must give undisturbed service despite pounding of streetcar lines and heavy vehicular traffic.*

Solution: *Put in a line just like the one that served so well in the same location for over forty years—a Dresser-Coupled line.*

Traffic was scarcely slowed down when this new line was installed to replace a smaller old one. Short, narrow ditches and immediate backfilling were made possible through the use of Dresser Couplings.

There was another good reason for choosing this type of construction. The old line—also Dresser-Coupled—had served successfully in this tough spot for over forty years. When the old couplings were disassembled, their gaskets were still resilient and still retained good packing qualities.

Dressers are factory-made, factory-tested; assure permanently tight joints every time. Even in sloppy weather, they can be installed at an average rate of two man-minutes per bolt. Because of their *proved* dependability, Dresser Joints are often backfilled before the line is tested. This is possible since—with Dressers—there's nothing to go wrong. Their specially compounded rubber gaskets even lengthen pipe life by cushioning the pipe against shocks and absorbing the stresses of earth movement.

For long-time dependability as well as maximum convenience of installation, specify a Dresser-Coupled line.

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THE MEMBERSHIP OF A
C. I. P. Century Club now has 2

The Cast Iron Pipe Century Club is probably the most unique club in the world. Membership is limited to municipal, or privately-owned, gas and water supply systems having cast iron mains in service for a century or more.

Although the Club is formally established, there are no dues, no regular meetings, and no obligation other than to inform the Recording Secretary if and

96%

OF ALL 6-INCH AND LARGER CAST IRON WATER MAINS EVER LAID IN 25 REPRESENTATIVE CITIES ARE STILL IN SERVICE.

Based on the findings of a survey conducted by leading water works engineers.

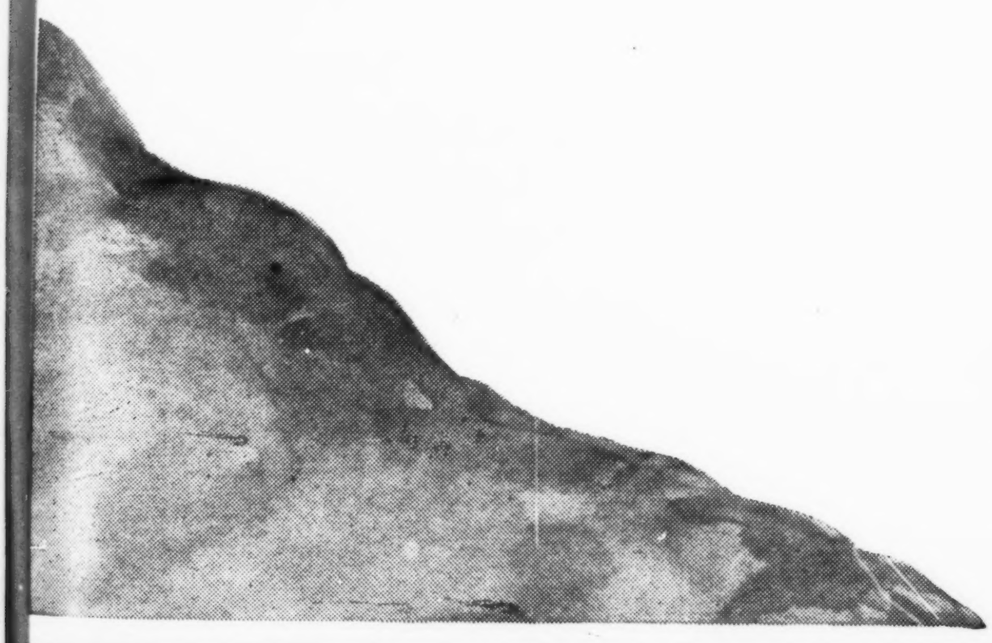
CAST IRON PIPE

DISTINGUISHED CLUB...
23 Members!

when the qualifying gas or water main is taken out of service, or, sold for re-use.

In spite of the unique requirement for membership, the Club roster grows, year by year. And why not, when answers to a questionnaire, mailed to gas officials in 43 large cities, show that *original* cast iron mains are still in service in 29 of the cities. And a survey sponsored by three water works associations, indicates that 96% of all 6-inch and larger cast iron water mains ever laid in America are still in service.

If your records show a cast iron main in service, laid a century or more ago, the Club invites you to send for a handsome framed Certificate of Honorary Membership. Address Thomas F. Wolfe, Recording Secretary, Cast Iron Pipe Century Club, Peoples Gas Bldg., Chicago 3, Illinois.



CLUB ROSTER

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WILMINGTON WATER DEPT.
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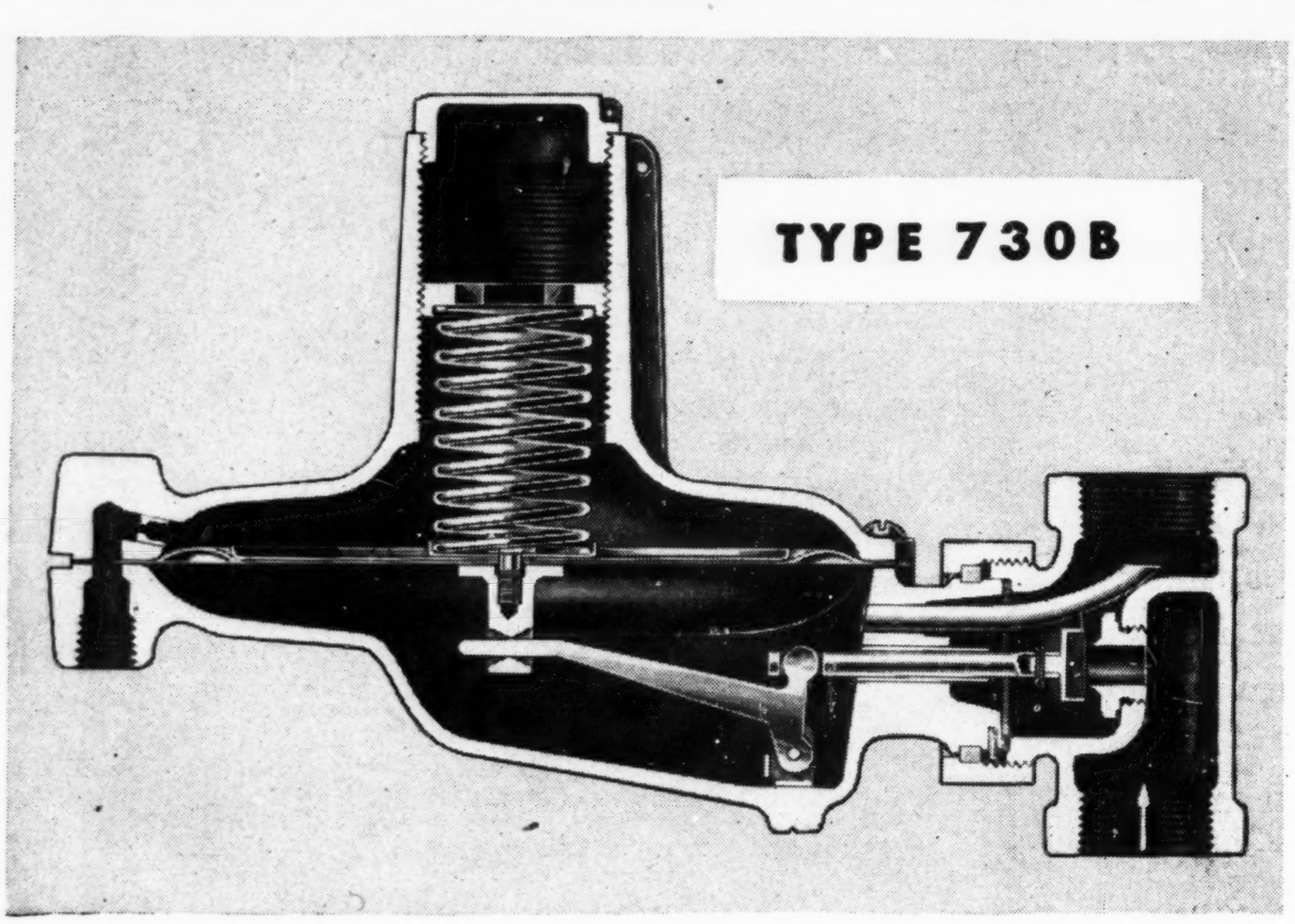
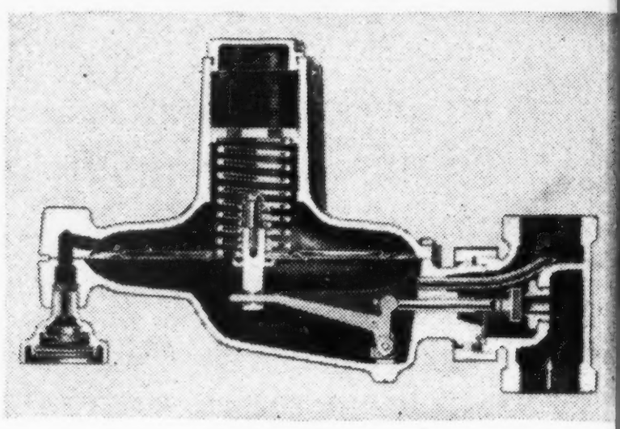
York, Pennsylvania

SERVES FOR CENTURIES

FISHER SERIES 730 SERVICE REGULATORS

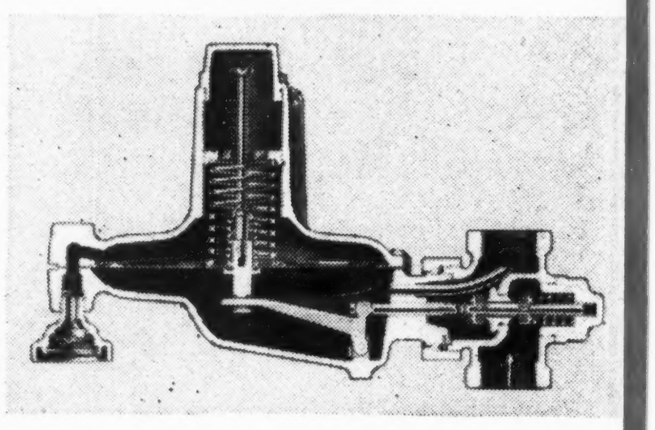


For any set of service conditions—the famous Fisher Type 730 Series is recognized as the logical choice. This complete regulator family offers a type that incorporates every desirable feature to provide satisfactory performance. High gas pressure in pounds is automatically reduced to a constant reduced pressure of ounces or inches of water column to the outlet system. Valve discs and orifices are both renewable without breaking any pipe joints. They can be readily inspected or replaced by simply unscrewing the union connecting nut. 730 Series are especially designed for manufactured, natural, Butane and similar gases. Used by major gas companies throughout the United States. Type 730B, illustrated above, is a general service regulator available in sizes ¾", 1", and 1¼", has a ¼" tap in the top casing for connecting piping out to atmosphere where regulator may vent safely. Also supplied with bottom weatherproof vent-Type 730BH for outside installations.



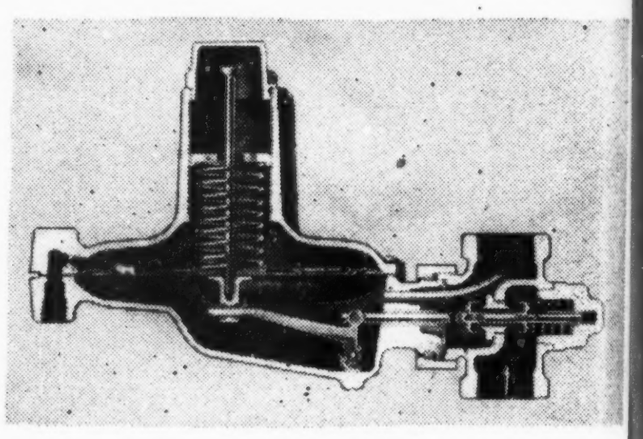
TYPE 733B

Type 733B with built-in relief valve, in sizes ¾", 1" or 1¼", designed for outdoor installation. A special weather proof and freeze proof vent protects the vent hole from being blocked by weather or insects. Available as Type 733BT for indoor installation. Upper diaphragm casing tapped for vent pipe to outside. Includes weather-proof vent.



TYPE 739B

Type 739B—Service regulator with the safety cut-off valve as described above but also includes safety relief valve set to relieve at 1 pound to eliminate over-pressuring the house piping and appliances.



TYPE 738B

Type 738B—Service regulator with safety cut-off valve which closes with loss of gas pressure and stays closed until manually opened. Eliminates explosion hazard during emergency loss of gas pressure.

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FISHER BUILDING
MARSHALLTOWN, IOWA

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IN U. S. SAVINGS BONDS
for Gas Company Salesmen

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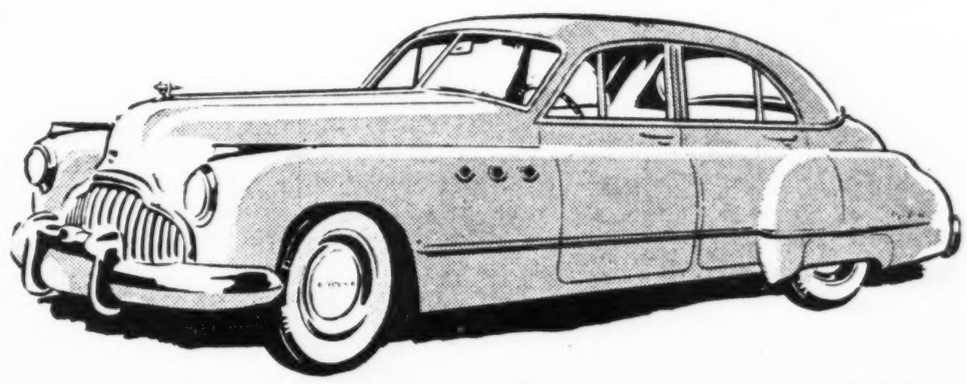

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Lawson Manufacturing Company
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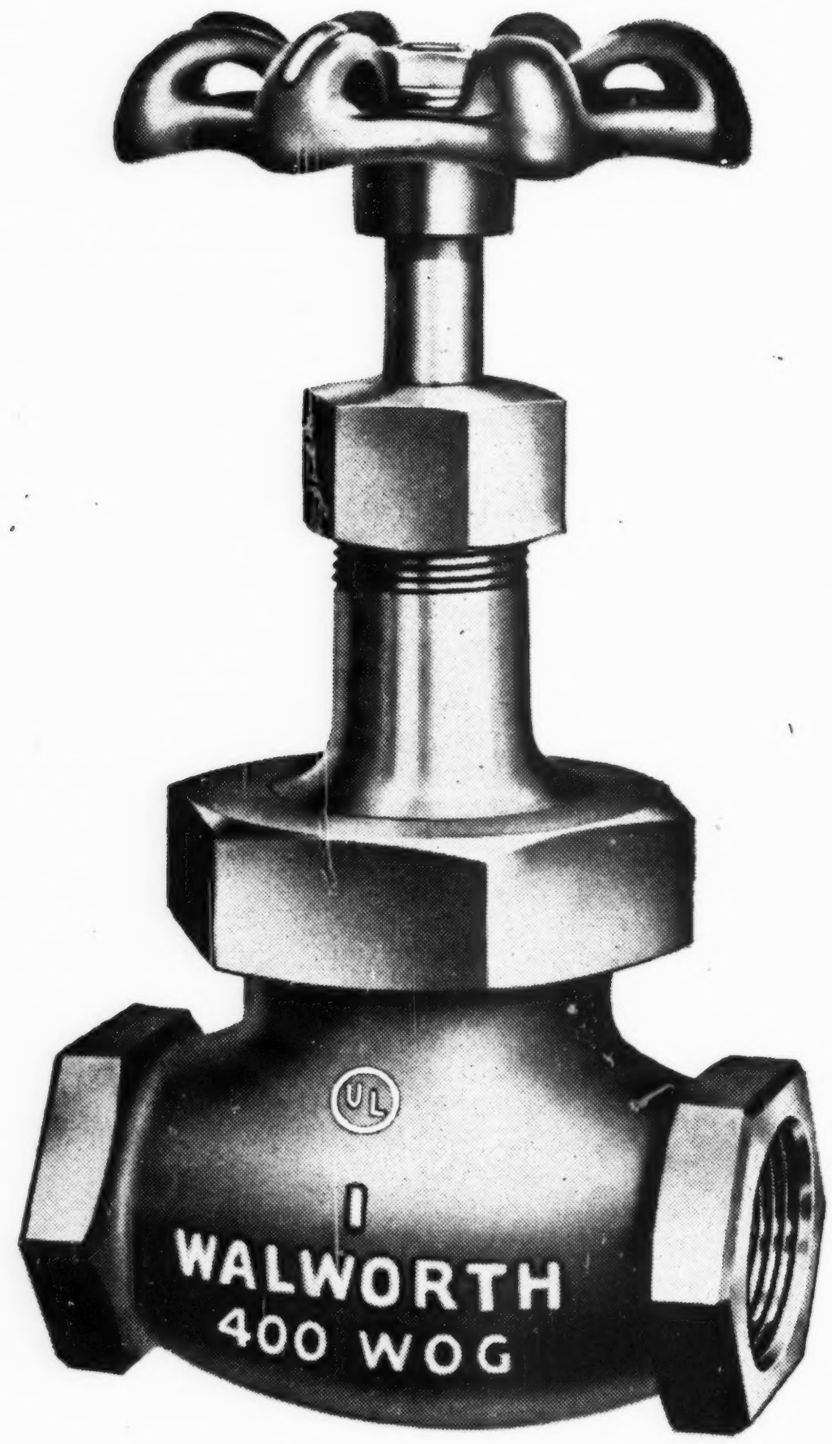
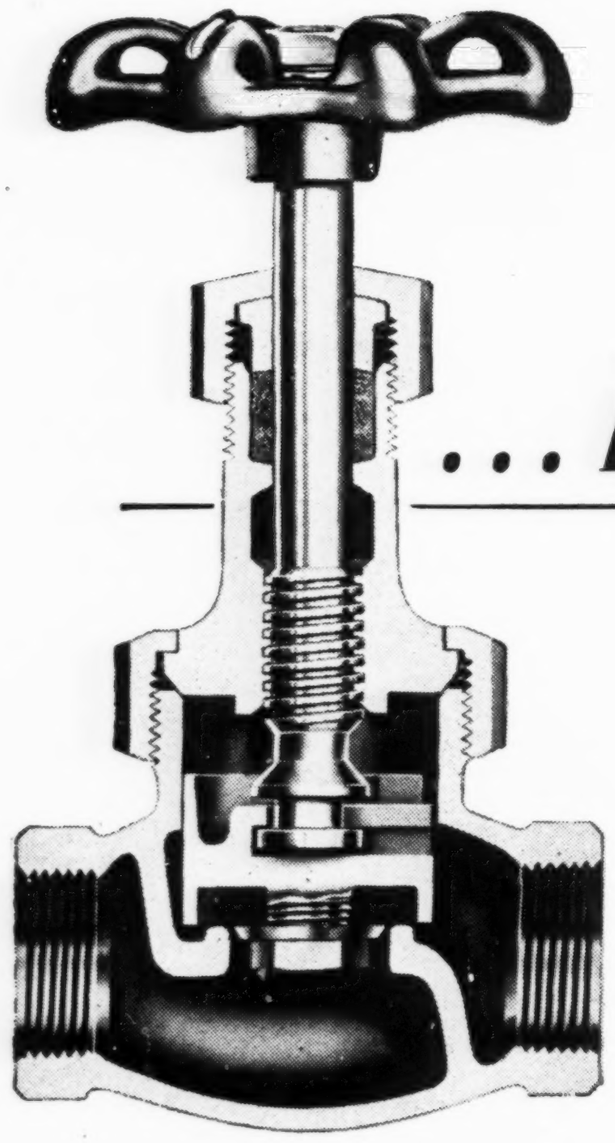
Built for LP-Gas Service

Approved by Underwriter's Laboratories





... inside and out!

Walworth's No. 91 Bronze Globe and No. 92 Bronze Angle Valves are designed especially for liquefied petroleum gas service.

These valves have rising stems and union bonnets. The stuffing box has a gland and is packed with a special material suitable for LP-Gas service, which gives a free-turning valve stem without leakage. The valve can be repacked under pressure when fully opened.

The discs are made of a synthetic rubber-like material unaffected by liquefied petroleum. These discs are cemented to the holders and further secured by the usual disc nut. Disc holders can be removed and new ones inserted easily and quickly. If the valve is fully opened before the bonnet is removed, the disc holder cannot fall from the stem. The disc holder's special construction keeps the disc accurately guided under all installation positions.

These quality valves are rated and marked 400 pounds WOG. *They are approved by the Underwriter's Laboratories for Liquefied Petroleum Gas Systems,* and meet all safety regulations now prevailing in the industry, such as those published in pamphlet No. 58 of the National Board of Fire Underwriters.

For further information on these long-life, economical Walworth Bronze Valves see your nearby Walworth distributor, or write for Circular No. 100.

WALWORTH

valves and fittings

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is in
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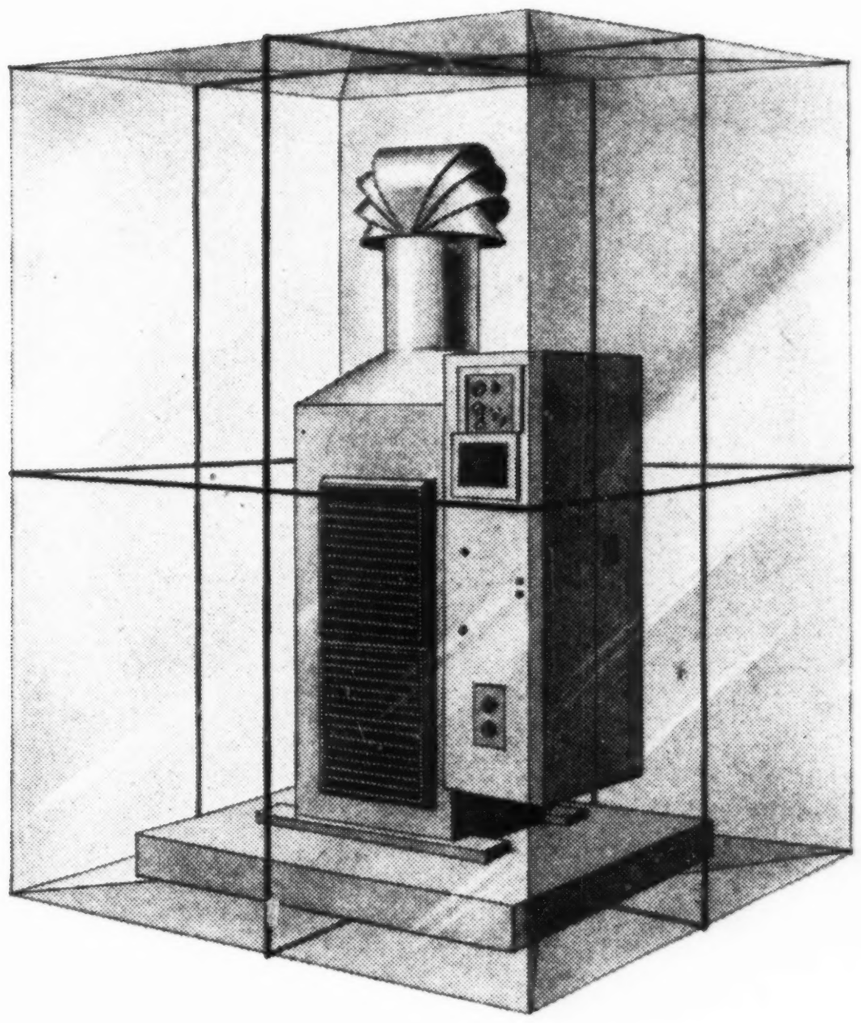


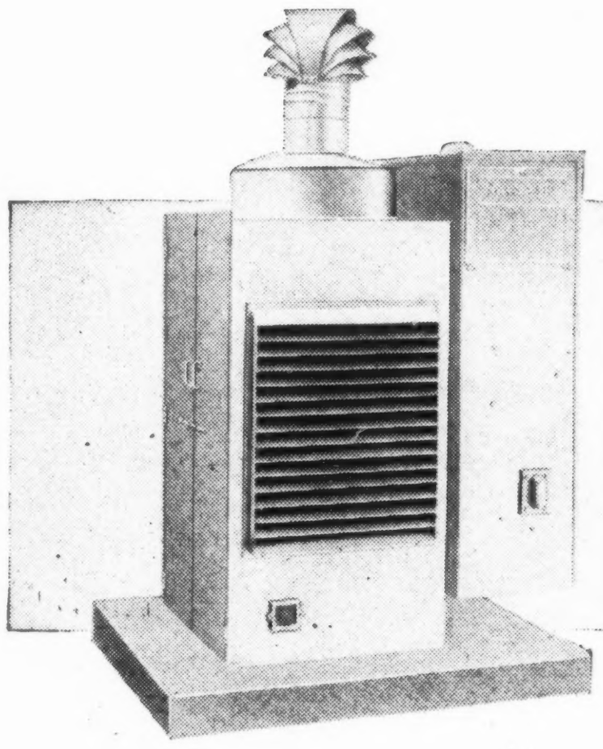
GASAIR...THE ORIGINAL PACKAGED LP-GAS PLANT

A liquefied petroleum gas installation, GASAIR equipped, is your most efficient and economical insurance against losses resulting from a reduced fuel supply. Hundreds of utility companies and industrial firms throughout the country are using GASAIR packaged gas plants as emergency stand-bys to prevent costly shutdowns that mean lost production. Users report cases of GASAIR plants paying for themselves during a single fuel shortage, while their cost is amortized over a period of years.

Here, in one compact unit, is a Propane- or Butane-fired vaporizer and mixer, ideally suited for stand-by, peak-shaving or 100% operation. When gas is needed the plant turns on automatically. Simple and efficient in operation, requiring no buildings to house it or power to operate it, precision-built for years of trouble-free all-weather performance... your GASAIR installation will pay for itself many times over.

Prepare NOW for a fuel shortage. Let our experienced engineers show you how a GASAIR plant solves your fuel supply problem and saves you money. Write, wire or phone today for details including design, estimates, installation, and servicing of GASAIR and other LP-Gas equipment.

For complete information regarding GASAIR, write for Bulletin 393-AC.



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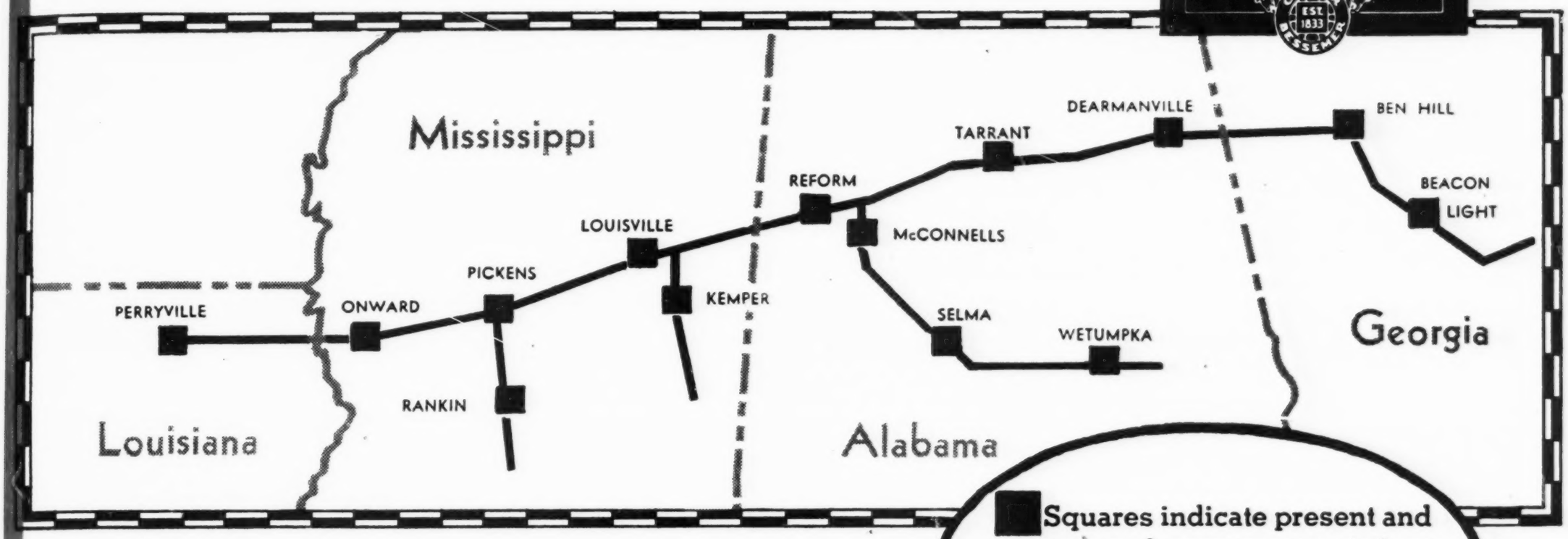

■ Squares indicate present and proposed compressor stations, those in red powered all or in part by Cooper-Bessemers now installed or on order.

Southern Natural Gas Company's experience with Cooper-Bessemer compressors dates back to 1929 when their first Cooper-Bessemer horizontals were installed—units that are still in service. However, with the development of the GMV, in 1935, Southern Natural met their new, expanding needs with these modern V-angles . . . saved space, housing and operating costs gained the simplified, low-cost maintenance and easy control for which GMV's are so well known.

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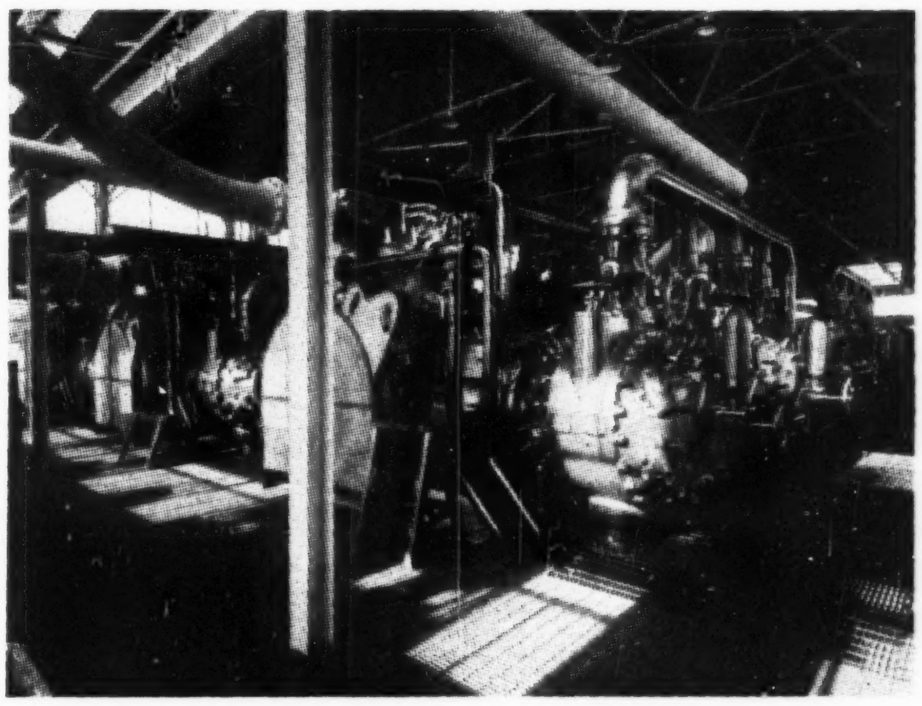

Perryville Station, Perryville, La., containing 6 GMV-8's totaling 4,800 hp.

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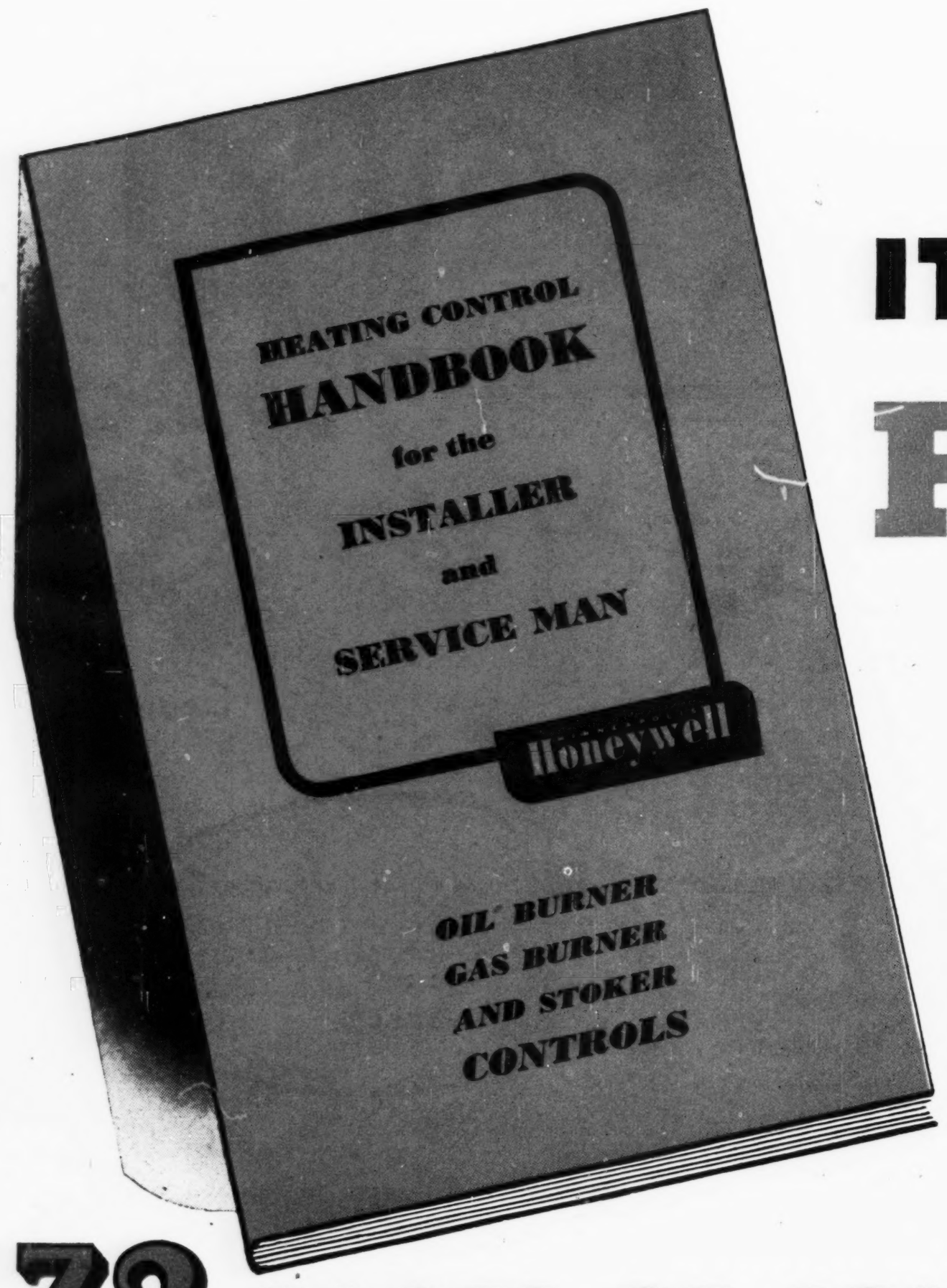

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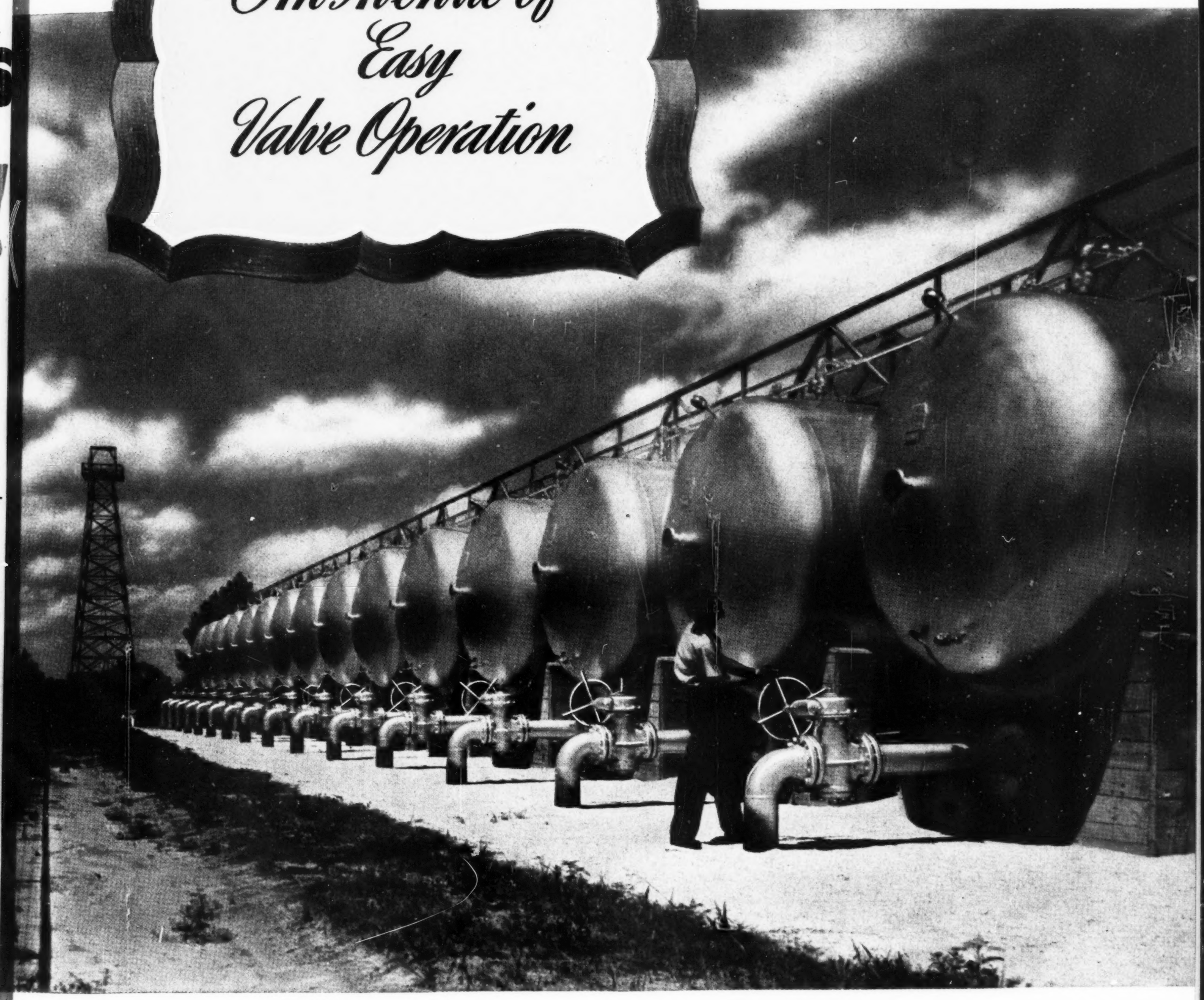

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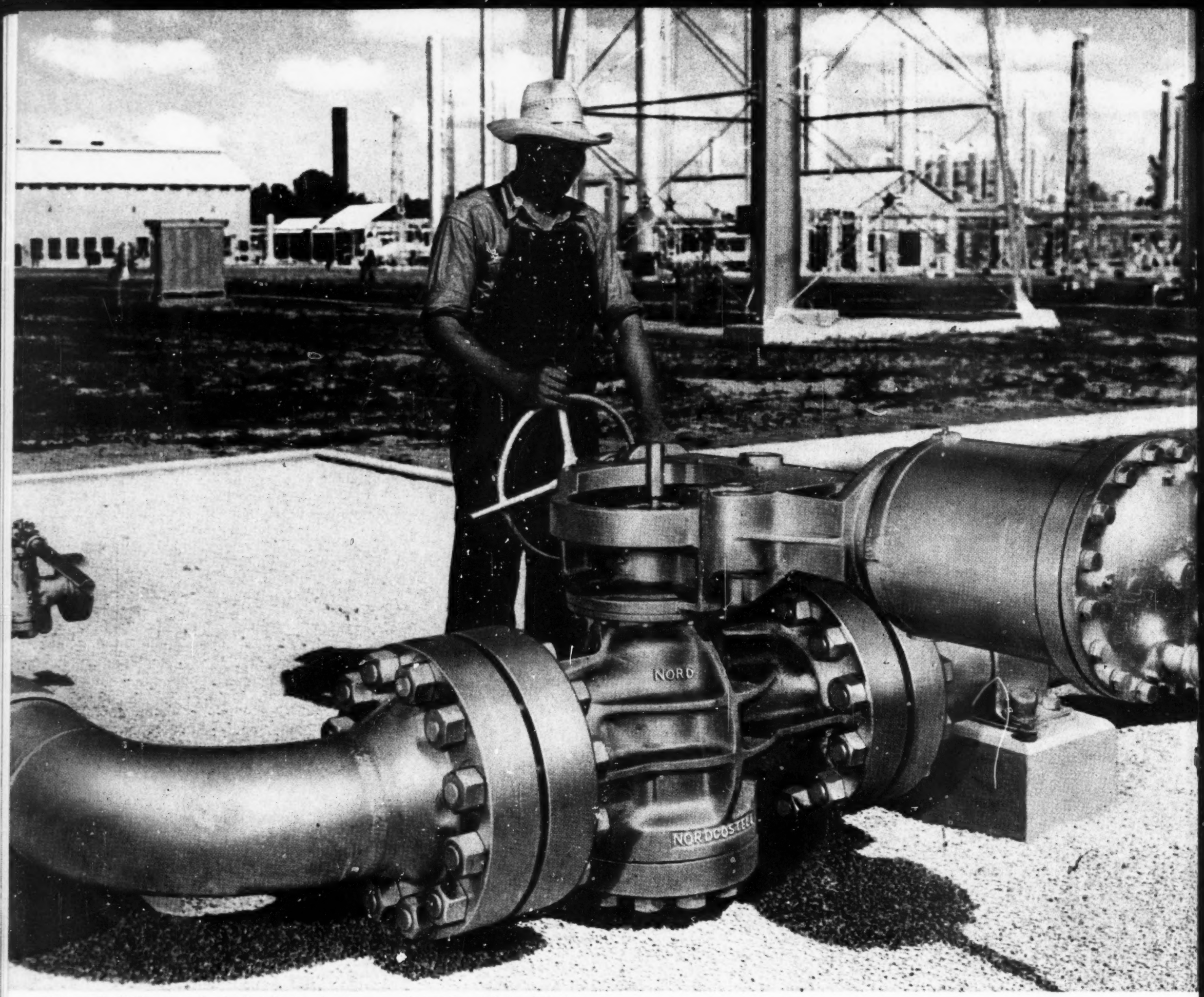
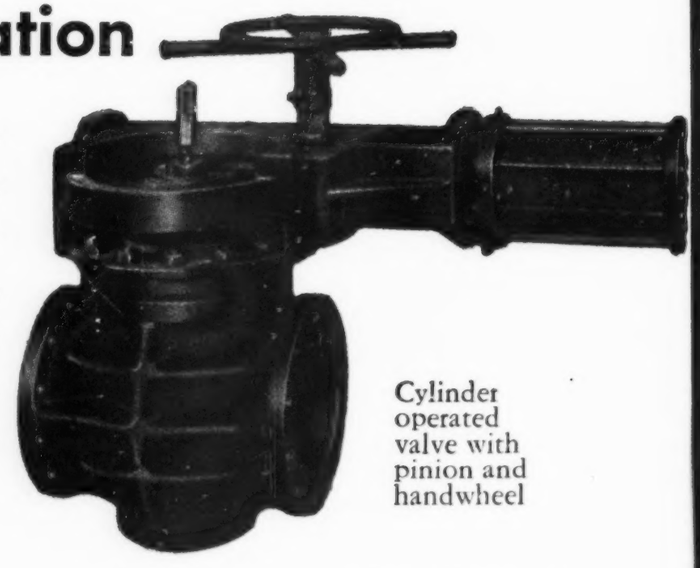


Hypreseal cylinder operated valve installation, showing manual operation with handwheel.

Remote Control or Hand Operation

Cylinder operated valve with screw stem, bevel gears and handwheel

For both power control and hand operation, there's a full range of cylinder-equipped Nordstrom valves. The design permits panelboard control from a remote central point or local manual operation. Air, gas, oil, water, and in many cases fluid in the main piping system, may be used as the operating medium. Electric motor operating units can also be furnished. Nordstrom field engineers everywhere can give you full details.



Cylinder operated valve with pinion and handwheel

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Highlights

GAS SALES WERE HURTLING UPWARD AT YEAR'S END. In the AGA president's annual report, published herein, Robert W. Hendee pointed out a 4.1% rise in customers, an 11.4% boost in sales, an 11.7% gain in revenues over 1947. Construction hit $875 million, a new high.

HOWEVER, THERE WERE SIGNS THAT THE GROWTH IS TAPERING OFF. While total number of new customers showed a greater gain than a year ago (3.2%), revenue gain was off 4.5% from last year's 16.2%, while sales increases were smaller. Changeovers to straight natural brought actual decreases in both sales and numbers of customers in manufactured and mixed gas categories, although both registered revenue increases.

STEEL SHORTAGES WERE TO BLAME FOR THE SLOWDOWN. Although construction topped 1947's mark of $730 million, the industry is still having back-order troubles. The FPC reported that of 377 projects approved between Feb. 7, 1942, and Aug. 31, 1948, 89 were still under construction on the latter date. In the case of 48 of these, materials delays were at fault. To Aug. 31 companies had spent $624 million on these projects, 53.9% of the total, with $534 million to go. Only 25% had been invested in projects completed.

STEEL SHORTAGES ALSO AFFECTED APPLIANCE SALES. While gas range sales soared to 2.8 million—as against 1947's 2,390,000, a gain of 25%—and automatic range sales jumped 300%, water heaters and central heating units dipped substantially. Pipeline shortages which brought conversion curtailments were to blame along with the sheet steel pinch.

WHAT ABOUT SHORTAGES IN 1949? A poll of manufacturers made by GAMA revealed universal pessimism. The consensus was: no better, very possibly worse.

LP-GAS GROWTH REMAINS THE SAME: PHENOMENAL. Last year total sales registered 2.6 million gal, topping 1947 by 29.5%. The increase alone outstripped the total volumes sold in 1942. Domestic sales skipped upward 33.9%. Percentagewise, the gain in sales to utilities amazed most of all —65.4%. More complete data appear under the byline of K. W. Rugh and E. O. Mattocks elsewhere in this issue.

FPC STANDS PAT ON ORDER GOVERNING FILING OF TARIFFS. Pursuant to the order of Oct. 30 (*GAS*, Dec., p. 73), 13 natural gas companies filed appeals for rehearings. The commission said in effect that companies' applications presented no arguments that hadn't been heard orally prior to the issuance of the directive.

MOVE AFOOT TO CHANNEL TEXAS GAS TO SAN DIEGO. Southern Counties Gas Co., Los Angeles, operator of the western portion of the Texas-to-California line, has applied to the FPC for approval of a 35-mile take-off from the Biggest Inch, to connect with a 50-mile line San Diego Gas & Electric plans to build. Volume of 40 MMcf per day would flow through the 16-in. pipe.

FINANCING OF MILWAUKEE CHANGEOVER APPROVED BY SEC. A $4.5 million financing plan filed by Milwaukee Gas Light Co., clearing the way for the company to take gas from the Michigan-Wisconsin Pipe Line Co.'s Texas-to-Michigan line, was okayed by the SEC last month. Previously, the commission had approved Michigan-Wisconsin's plan, and completion of the project was set for late 1950. Another new development last month: Michigan-Wisconsin joined Michigan Consolidated and Austin Field Pipe Line Co. in seeking an amendment to its certificate which would increase line capacity by 28 billion cu ft.

TEXAS FLARE-GAS FIGHT SWINGS INTO 1949. The railroad commission has cited operators in 26 more fields for hearing Jan. 25. A court test resulting from injunctions obtained by operators in fields previously ordered closed in for failure to halt gas flaring is also foreseen.

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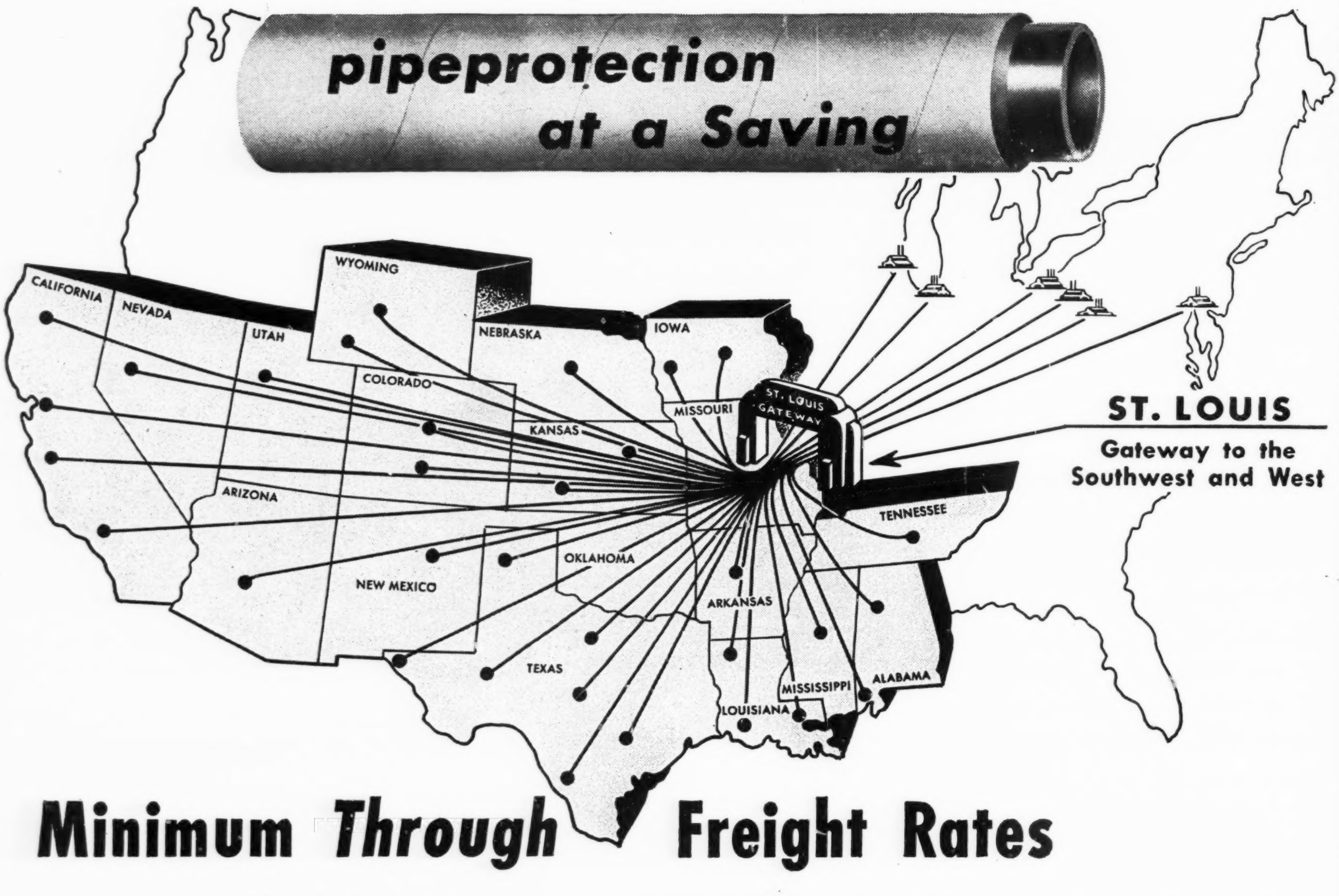

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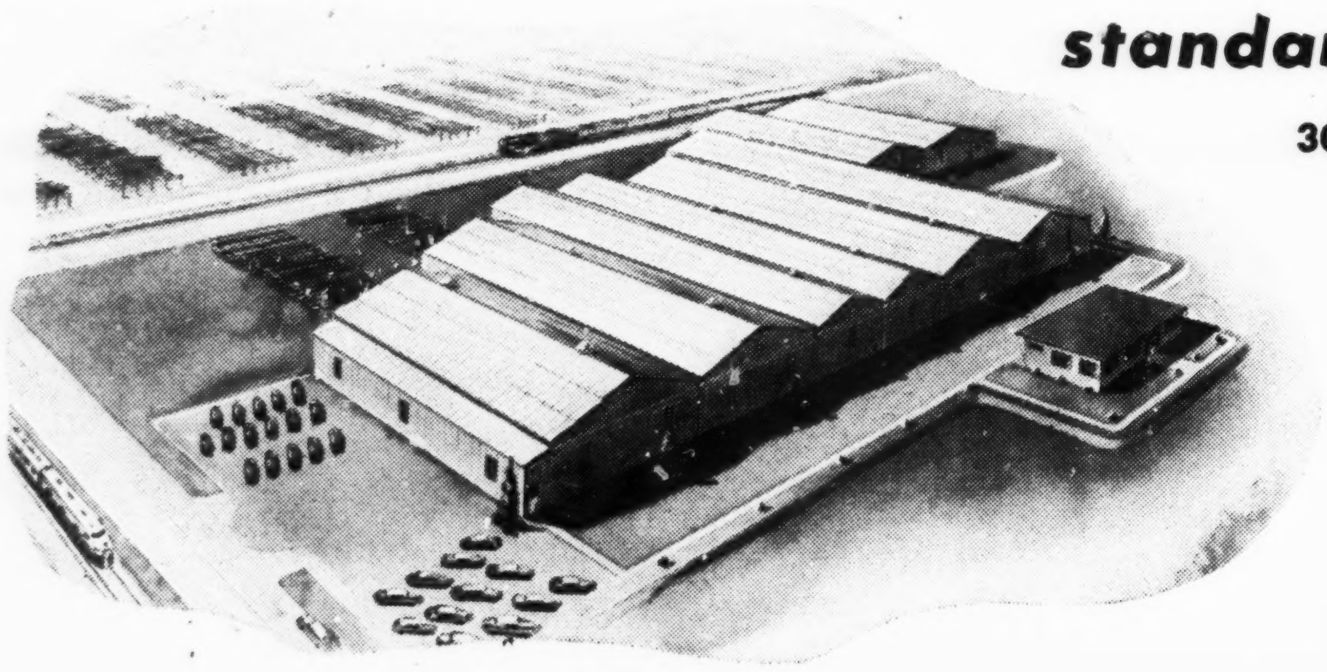

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THERMALLY THINKING

As the Year Begins

THE year 1949 opens with the gas industry clicking along at an all-time high by every standard of measurement. Large and continued expansion over a period of years is a certainty.

Meanwhile there are already rumblings along the Potomac, a prelude to the struggle ahead which the year 1949 will bring. This contest will help determine at which point between the most extreme opinions of advanced New Dealers, on the one hand, and the free enterprise idea, on the other, regulation of the industry will settle down.

Robert W. Hendee, president of the American Gas Assn., points out in his year-end review:

> During 1948 more customers were served with gas than ever before. Output of gas attained a new high level. Gas utility revenues reached an all-time peak. Capital expenditures for construction and expansion of gas utility systems surpassed any previous figure.

As pointed out by Frank J. Nugent, president of the Gas Appliance Manufacturers Assn.:

> Gas, comparatively today, is the cheapest source of energy. Sales of gas ranges, gas refrigerators, gas water heaters, and gas space heaters have reached all-time highs. With the rate of discovery of natural gas reserves far exceeding present consumption, and with new technological developments which will reduce the cost of gas manufacturing, industry executives see no limit to the expansion which gas appliance and equipment manufacturers and their dealers can attain.

Every Local Distributor?

ANYTHING about "at the cross-roads" is a pretty trite expression. But when one considers some of the threats of domination, hints of which have been coming out since election, the conclusion cannot but be reached that the industry, in the midst of all this flush of activity, and preoccupied as it is with immediate problems of management, needs to be alert nationally.

There is still a Congress with widely varying shades of opinion, and lots of things can happen before the hopes of some Washingtonians can be put into effect. Yet there are a few straws in the wind that indicate the need for watchfulness.

For instance, there is the position taken by counsel for the Federal Power Commission, in a court proceeding during December. As reported by the Independent Natural Gas Assn. of America, virtually every local distributor of natural gas in the United States would be brought under FPC jurisdiction, if this position is upheld.

The stand of counsel was taken during oral argument before the United States Court of Appeals for the District of Columbia in the case involving whether or not the commission is correct in its attempt to assert jurisdiction over the East Ohio Gas Co., which is a distributor of gas in Ohio operating entirely within that state.

William Tarver, FPC counsel, contended that because the company transports the gas from the interstate pipeline before distributing it, that transportation, even though within the boundaries of Ohio, constitutes continuance of interstate transmission. Therefore, he concluded, the company is subject to FPC jurisdiction.

Judge Prettyman then inquired as to what would happen in the case of an interstate pipeline company transporting gas from Kentucky to Pennsylvania under these circumstances: Suppose the pipeline company sold gas for resale to local distributing companies in Roanoke, Richmond and Staunton, all in Virginia. Each of these distributors had a stub line to carry the gas from some point in Virginia to another point in Virginia for actual distribution. (No limitation was made in this inquiry as to the length of the line, whether it was 100 yards or 100 miles).

Would the FPC take the position that such transportation of gas through the stub line constituted grounds for the FPC to take jurisdiction over these three local companies?

Mr. Tarver replied that it *would* give the FPC jurisdiction. Judge Prettyman commented that if this were true practically all of the local distributors in the country would be subject to the commission's jurisdiction.

Answering other questions by Judge Prettyman, Mr. Tarver said the commission is attempting to take jurisdiction over East Ohio Gas in order that the company can be required to submit to the uniform accounting practices of the commission. Judge Prettyman suggested nothing would be gained by the FPC getting jurisdiction, since the Ohio commission already regulates East Ohio's rates and service.

Congress Can Decide

IN a recent significant decision, the U. S. Circuit Court of Appeals for the District of Columbia set aside an order of the FPC holding that the Border Pipe Line Co. was a natural gas company within the meaning of the Natural Gas act, and thus must have a certificate of public convenience and necessity.

In this case, Judge Prettyman pointed out that "the operation before us is wholly local, and it is only because of petitioner's sales for foreign commerce that the commission seeks to control all its activities."

We won't attempt to go into all the ramifications. But some things toward the end of the judge's words have comfort for those who prefer to be ruled by the freely chosen representatives of the electorate:

> "Questions such as the one presented in this case are properly for the Congress. . . . Congress uses expressions of established meaning. . . .
>
> "But the administrative body finds a sufficient penumbra of meaning to justify a claim for more authority than appears upon the face of its grant. . . .

"It is bad from the viewpoint of sound government for the courts to twist strange results out of otherwise understood expressions of the legislature."

"The Congress," the judge said, "is in frequent session, its doors open and its committees available. Its procedure is no more complicated than that of the courts. If an administrative agency thinks that the real intent and purpose of a statute is broader than or different from its terms, it need only ask Congress for an enlargement or clarification. . . ."

Alphabetical Battle?

FURTHER evidence of how the FPC appears to be trying to extend its power, in contest sometimes with Congress and sometimes with other government agencies, is shown in the ruling by the commission in December, for the first time in the history of the natural gas industry, that a bond issue to finance new construction had to be sold at competitive bidding.

It concerned the $50 million first mortgage bonds to be sold by Tennessee Gas Transmission Co. to finance two new pipeline "legs." On the request of Halsey Stuart & Co., investment bankers, who wished to make an offer for the bonds, the FPC held that under Section 7(e) of the Natural Gas act as amended in 1942, it had power to attach to the certificates issued a condition requiring competitive bidding.

The commission stated that Tennessee Gas had opposed competitive bidding, and had contended that continuing its previous method of arranging financing by negotiation would bring about a lower overall cost of money for expansion. Stone and Webster Securities Corp. and White, Weld & Co. had managed underwriting groups for sale of all securities issued by Tennessee Gas since 1945.

Here is an instance of the well-known Washington game of one agency trying to extend its power and influence by expanding into the field of another. Up to now the Securities and Exchange Commission has controlled this sort of thing. It will be of interest to observe whether the SEC will take this challenge lying down, or will rise up and tell the FPC to get the ..... back into its own bailiwick.

Tough Sledding

COMPLETION of the financing of the $193 million pipeline of Trans-Continental Gas Pipe Line Co., to bring gas from Texas to the Northeast was a struggle. It would probably not have been quite so much so if economic forces were allowed to play more freely in the United States today. The post-election market was bad anyway, as evidenced by the decline in Wall Street quotations.

The financing job was completed during December, when $26.5 million was raised from underwriters on interim notes payable later in preferred stock. To put the deal over, the originating stockholders subscribed to more than half of an issue of $22.5 million stock. To add to the attractiveness, the promoters sold to the company at original cost 265,000 shares of common stock. This meant the public purchasers of interim notes could get two shares of common stock with each $100 note subscribed, rather than one share of stock and the right to buy another.

Expensiveness of the money is indicated by the advance of the yield on the notes at offering time to 5.72%, against original plans for a dividend of about 5% on preferred stock. After all, though, it was a mammoth job of financing in a bad market.

Will Confiscation Be Legalized?

AMONG the other problems the industry still needs to be alert about in 1949 and the next few years is that of the "Vanishing Rate Base," covered in the February, 1947 issue of *GAS* by Samuel H. Crosby. Mr. Crosby contended that the FPC's administrative policies could lead to involuntary liquidation of stockholder equities and confiscation. As stated then by R. H. Hargrove:

"In the establishment of the rate base the question of whether the accrued depreciation should be deducted is of paramount importance. If the deduction is proper to fail to recognize this fact would be unduly to penalize consumers. On the other hand, if the deduction is improper, to insist upon its being deducted results in confiscation." Mr. Hargrove submitted that "in a static property whose plant account is unchanging" the ultimate result could be "to extinguish the rate base (except for working capital and other minor items), thereby completing the transfer of the property from the company to the consumers."

As Mr. Crosby pointed out, if public ownership of the natural gas industry and expropriation of gas reserves is desired, it is reasonable to expect the Congress to adopt equitable laws to that end, consistent with the basic rights of private property. But if Congress does not favor public ownership, it should amend the Natural Gas act to define depreciation policies.

Turn-of-the-Year Items

ROBERT E. GINNA, vice president, Rochester Gas and Electric Corp., thinks the hot water heater effort is one of the most vital undertakings of the gas industry, and that an additional approach is needed on it.

Why not more emphasis on the health angle? he asks. Surveys, he points out, have shown that hot water is unimportant to a surprisingly large number of families. The idea of plenty of readily available hot water must be put over, apparently, with the same two-fisted tactics that sold mechanical refrigeration a while ago.

Mr. Ginna thinks what's been done to promote the electric blanket idea is of interest. The health angle was introduced. It seems the American Medical Assn. wouldn't go so far as to say an electric blanket would cure a cold, but they do say it's a preventative. And that health incentive with good authority behind it is being used to sell electric blankets. Hot water has some even more clear-cut and undebatable health angles. Why not use them more emphatically?

Water heaters are proved money makers. And if manufactured gas companies are going to get new money, they need good earnings.

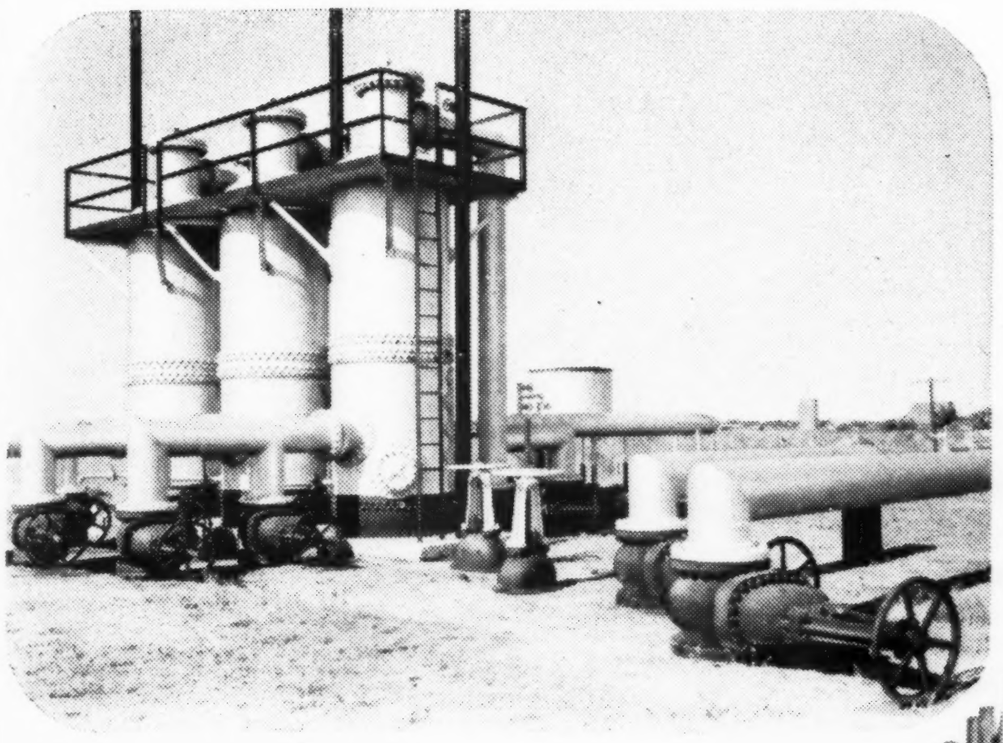
Incidentally, Rochester Gas and Electric has had a very large sale of water heaters per customer. They won't quite say necessarily it's the largest per customer in the country, but it's plenty large, and they're making plans for 1949.

* * * * *

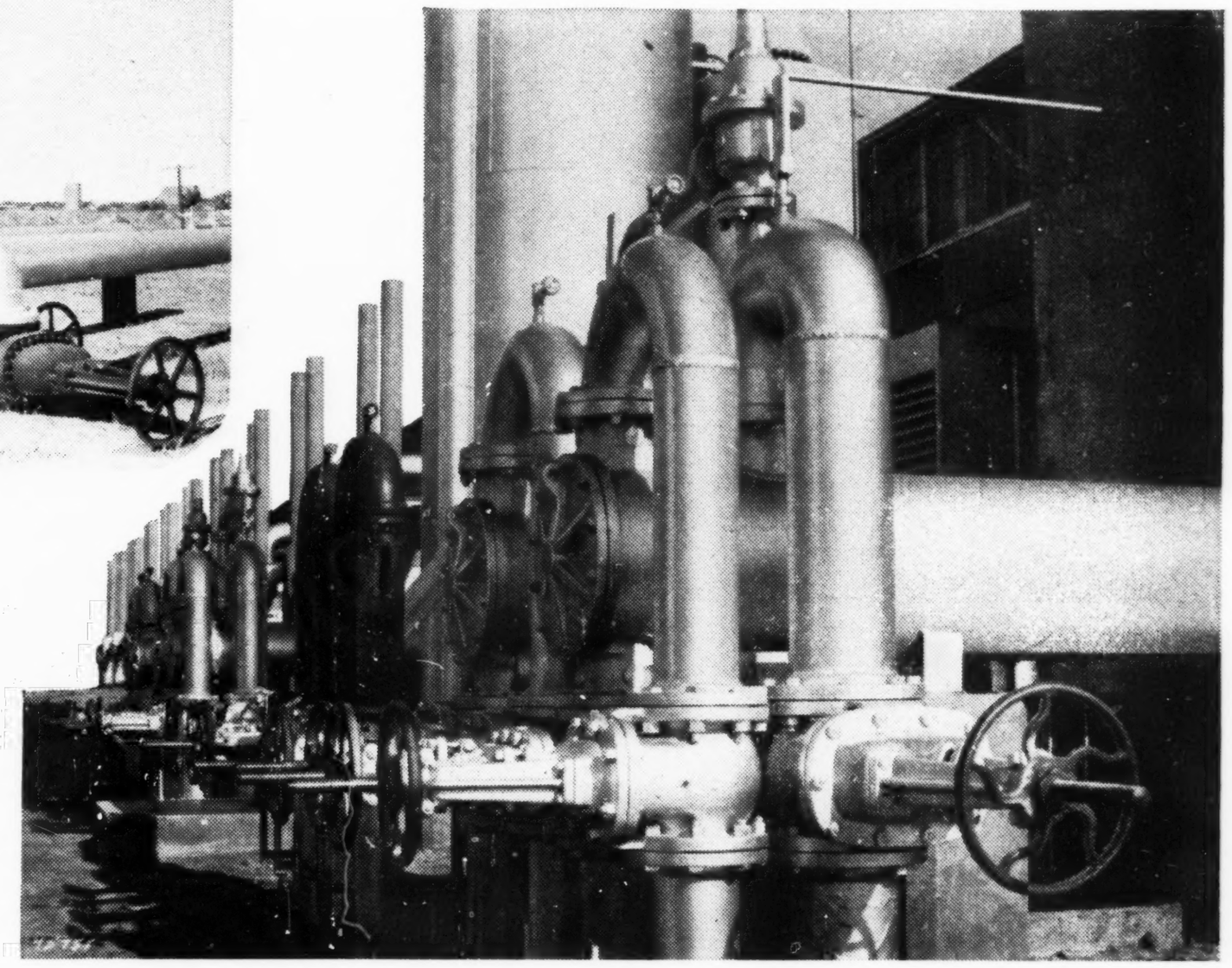
A fast, effective method of evaluating oils for gas making purposes has been worked out by the gas production research people of AGA. Sixty tests have been made. To carry the work forward, cooperation of companies is needed in checking their oils. This is a busy time, but cooperation will help all concerned.

* * * * *

One cannot but note with interest the reported stepping up of the electric industry's public relations program. Yet they haven't been able to do anything about recent publicity on the lobster cooking situation. It seems that radar, the latest possible near challenge to gas in a few parts of the commercial cooking field has its disadvantages for lobster cooking. This is according to Robert Jahrling, lobster king from Springfield, Mass., as reported by a press association. Jahrling gave his opinion about the failings of radar for lobsters at the Northeastern Regional Restaurant Convention in Washington, D. C. We're told some chains of hamburger stands, which also tried radar are sour on it, and presumably back in the gas fold.



ON A GAS SCRUBBER—*Crane 16-in. gate valves at a 12,000 h.p. booster station.*



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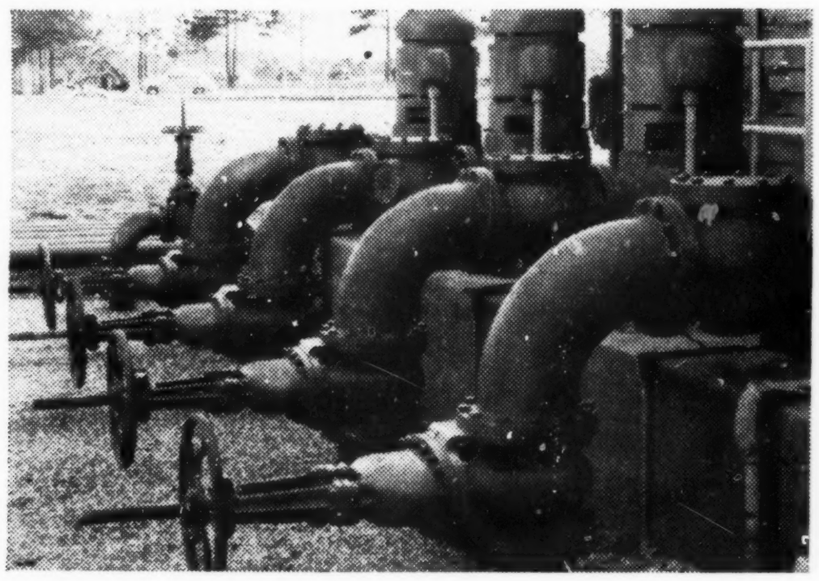

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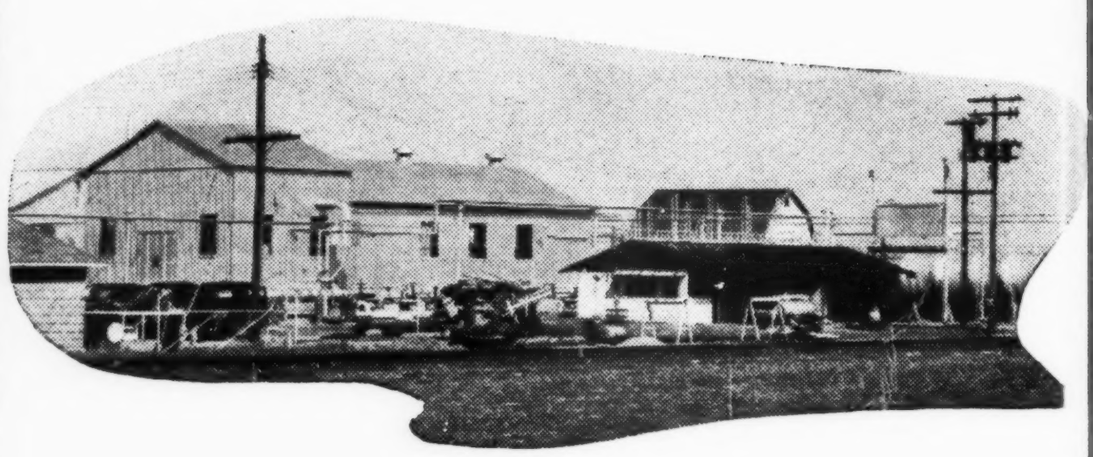
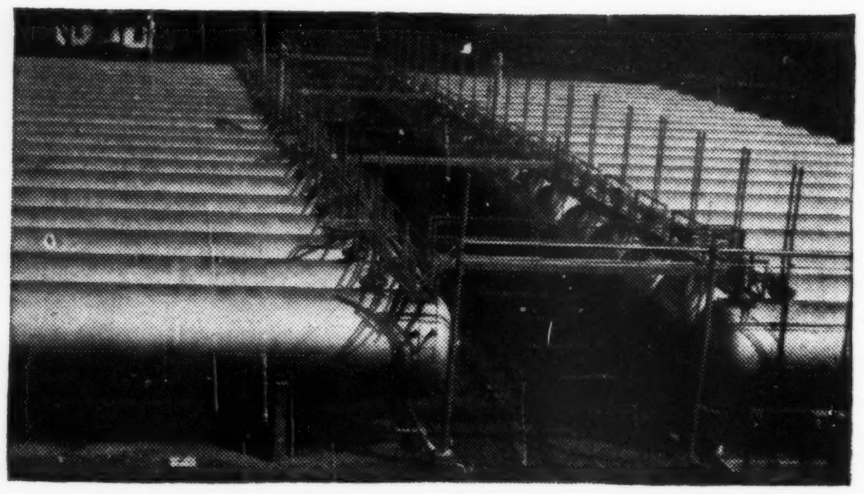
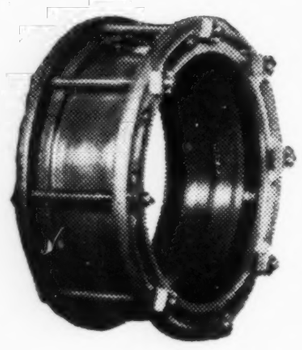


STACEY-DRESSER ENGINEERING—L. P. G. PLANTS



STACEY BROS. GAS HOLDERS



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Whether it be a tank, or a whole L.P.G. Plant or an underground liquefied storage installation—Dresser Industries will give you what you need.

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PROMOTIONAL NOTES AND NOTIONS

by Stanley Jenks

This Year

OF course, now that the greeting card deluge is over, we have all had our quota of wishes for a happy and prosperous new year from relatives and friends.

So, reinforced with the moral backing of our friends, we are starting a new year, in which (sez he poetically) we mount another rung on the ladder of life. He's a poor fish who hasn't some goal in mind—so may all our goals be realized.

The year itself—and true to form—has many question marks. There is one question mark, however, that was answered by the discerning in 1948. And that is, the buyers' market has definitely arrived in household apliances, with possibly such exceptions as television and air conditioning.

Supply has caught up with demand in most items. One department store executive friend of mine put it this way when I was talking to him last week: "They (consumers) have quit reaching for goods. Now, we've got to do the reaching." As comptroller of one of the nation's leading department stores, he said that in 1949 his people feel that satisfactory volume will only be maintained by the intelligent use of "promotions." "Promotions," I found out, are items sold at lower than normal prices but carrying the regular mark-up. They are dug up by alert buyers, who find a manufacturer with too much inventory and too little cash. A recent example was 25,000 pure silk ties, sold in two days, carrying a $1 retail price, and it is assumed carrying the store's regular mark-up.

My friend sees such volume very much to the fore in 1949, especially in the electrical appliance field.

This concerns us, so perhaps our best advice to our gas appliance dealers would be to get their inventories down, put themselves in as good a liquid cash position as possible, and be prepared to grab some 1949 "promotions" for themselves. But let's be sure that they clearly understand we are not advocating they cut their percentage gross at the retail level.

Fuel Forecasting

T R. Rhea of General Electric Co., according to the *New York World-Telegram*, has gazed into his crystal ball and made the headlines with a prediction that there will eventually be a swing back to coal from natural gas and petroleum products as the nation's chief source of fuel.

For the year ending October 1948, according to the AGA Monthly Bulletin of Utility Gas Sales, our industry sold 31 million thousand therms, of which 28 million were natural gas. In other words, we are very much interested in what goes on in the nation's fuel bin both today and many tomorrows. We have many billions of dollars invested in our facilities, and we plan to invest another $5 billion before 1951. So, we are really very confident that, despite any dire predictions to the contrary, we are going to be selling more and more gaseous fuel to an appreciative public.

Mr. Rhea doesn't qualify for the customary "Jeremiah" mantle, in that he concedes "proved" reserves in the United States are increasing. But he offsets this by claiming they are not increasing as fast as consumption. Which is, shall we say, a somewhat controversial point. While oil industry economists expect petroleum demands to be around 6% ahead of 1948, the fact remains that our big bottleneck is not production so much as more pipeline facilities to get gas to the industrial and domestic customers, who, in this instance, are definitely "reaching" for it.

The alarmists have cried "wolf" so often about the future of the gas industry that we cannot get excited about it any more—except excitedly enthusiastic.

However, if the coal thesis is built on the hypothesis that the known reserves are less limited than ours, then it completely discounts the human and economic factor that we will continue to use the better so long as it is available. That is why the majority of people continue to prefer gas to electric cooking. Gas is better.

Cooking Classes for Men

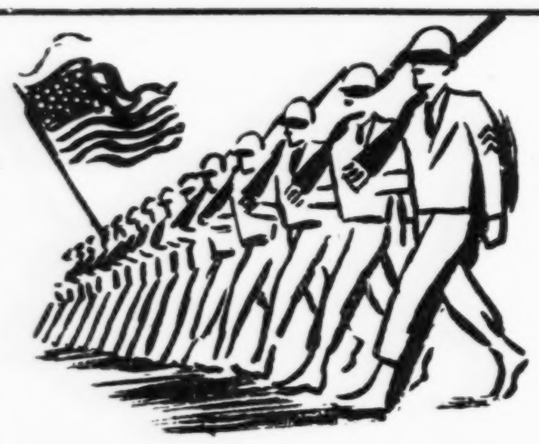
THE British, who are still living the life austere, are nevertheless carrying on in their traditional style to make the best of a condition resulting from an all-out war effort. The gas industry has made remarkable progress despite a major war and all its consequences, according to the Ministry of Fuel and Power Statistical Digest for 1946 and 1947, and despite the forthcoming nationalization of the industry.

In Britain, they have a far worse domestic help situation than even we have. So it was a happy inspiration when one British company organized, through its home service department, a course in household management for men. The response was terrific, proving that the classes were meeting an urgent need. One enthusiastic student was a 70-year-oldster, taking care of an invalid wife. Another student, a foreman in a milk factory, made himself ill eating his own cooking while his wife was away on a vacation. He feels every man should be able to look after himself in such emergencies. An amateur gardener, interested in his vegetables from garden to table, signed up. Even a baker and the owner of a private hotel felt this an excellent opportunity to add to their professional knowledge.

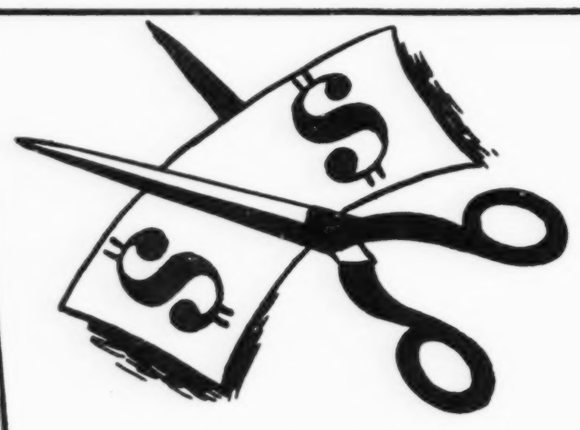
Then, of course, in a land of high taxation there are the involuntary bachelors, who cannot afford to marry. The idea clicked there, and, as we look around here, it has much potential merit in our inflated situation.

The domestic cooking load is our base load. We want to get as much cooking done as possible at home. Have we an untapped field of home cooking talent right on our doorstep, which only awaits encouragement and rudimentary training?

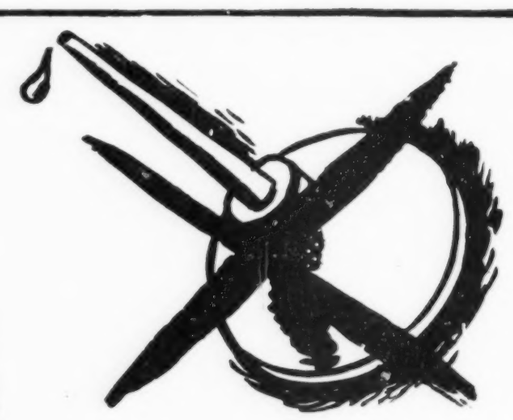
9 reasons why engineers everywhere now specify VULCAN DIAPHRAGMS



VULCAN Diaphragms are completely uniform—scientifically manufactured.



VULCAN Diaphragms cut costs.



VULCAN Diaphragms need no oiling—do not dry out.

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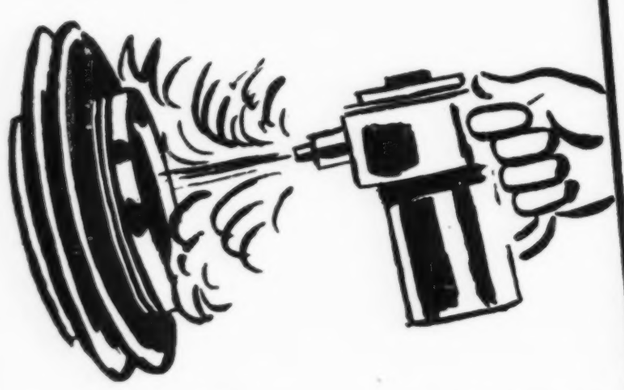
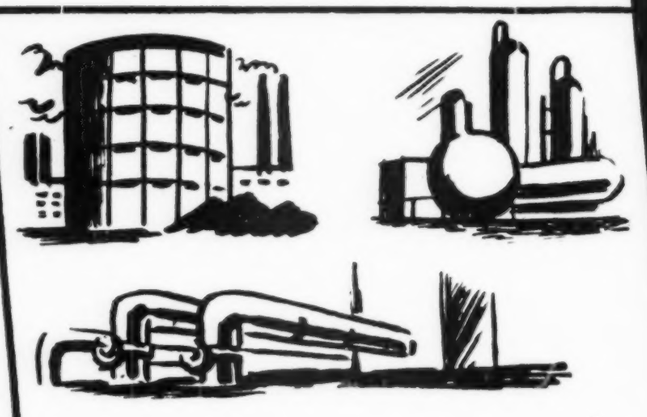


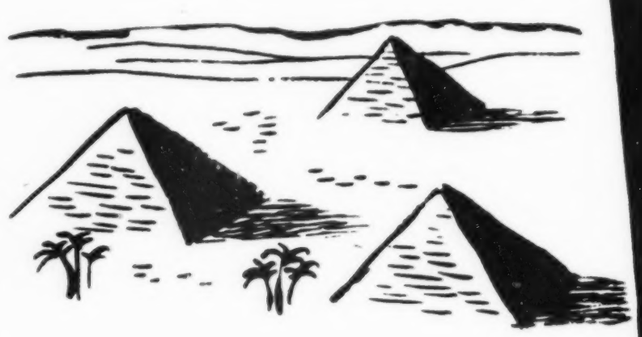
VULCAN Diaphragms are no fire hazard, as in the case of oiled leather.



VULCAN Diaphragms work equally well in all 3 types of gases.

VULCAN Diaphragms are clean to handle—never messy.

VULCAN Diaphragms are installed with less time and effort.



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For more accurate metering, greater economy and all-round advancements, insist on VULCAN Diaphragms in your meters.

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TECHNICAL TRENDS

by Guy Corfield

What Is Meat Flavor?

MUCH testing and more arguments have resulted from attempts to prove whether meat tastes best cooked by gas or electricity, at low temperature or high temperature, etc. Results of such tests have so far been evaluated by opinions based on the participants' sense of taste and odor, which together produce the sensation of flavor or palatability. The human senses are wonderful mechanisms, but subject to all the variation and nonstandardization of the human bodies in which they reside. Scientists and technicians are continuously trying to isolate and identify the factors that stimulate the senses, and measure them by standard tests and instrumentations, and express them in conventional chemical or physical terminology. If they succeed, facts may replace opinions.

The Arthur D. Little Inc. laboratories have undertaken a fundamental investigation of meat as part of a comprehensive study of the flavor of unseasoned cooked foods. So far, it appears that it is the action of heat on the fiber of meat rather than on the juices, that produces the flavor. When the juices are removed from meat by pounding and leaching in water, a grayish fibrous mass is left which has practically no taste or odor when raw, but develops the characteristic meat flavor when cooked. The flavor appears to be more odor than taste, and to be due to formation of cracked or decomposed amino acids. Meat juice by itself, when cooked, did not develop any meaty flavor.

"Hydrafrac" Well Treatment

EVEN to those actively engaged in the work, it must be fascinating to observe and consider with what skill and precision an oil or gas well can be drilled and manipulated, and what delicate operations can be carried out thousands of feet below the earth's surface. A new operation and accomplishment has just been added to the bag of tricks: "Hydrafrac," an abbreviation of hydraulic fracturing. The purpose of this operation is to fracture the face of the underground formation at the production level of the well, to enable a better flow in or out of the formation.

The operation in general consists of pumping a viscous material down the well with sufficient force to penetrate and fracture the underground formation, which material will disperse when the pressure is taken off. By the use of "formation packers" the material can be applied and the effect can be localized to any desired depth and level.

Some of the unique properties of this viscous hydraulic material are: It must be sufficiently viscous so that it can be injected at a sufficient pressure to cause fracturing; it should carry sand or other "propping" agent so that the sand will support the fracture and not allow it to close when pressure is released; it should be, for most purposes, of an oil base rather than a water base; it should be either self-thinning, by breakdown of emulsion after a suitable time, or capable of solution by a following liquid so that it will not stay in place and plug the crack.

The most suitable material so far has been an adaptation of the war-developed "jellied gasoline," which is an emulsion mixture of gasoline or other light hydrocarbon with a powdered soap called Naplan. By selecting the hydrocarbon, any degree of viscosity can be obtained. This emulsion will support and carry sand. It is relatively unstable and soon breaks down to the fluidity of the hydrocarbon, and the time of breakdown can be controlled by using certain minor additives such as a fraction of a per cent of water. If immediate breakdown is required, a following liquid, such as petroleum sulfonate in gasoline, can be used. It has been found possible to compute at least approximately the necessary pump pressure and rate to produce and extend the fractures, and to know even the exact time of fracturing as a drop in injection pressure is observable.

Instruments

AS we improve in industrial technology, and time and labor become increasingly valuable, more and more reliance is placed on instruments. The modern plant features the control room with an impressive display of instrument dials and signal lights, with an attendant for observation purposes rather than operation.

Credit for these developments goes to the army of technicians and sales engineers who develop, produce, sell, install, and maintain these instruments, and to industry which avails itself of them. Instrumentation is a big field and has its own publications, organizations and meetings. It is interesting to note that the Instrument Society of America has recently held its third National Instrument Conference and Exhibit in Philadelphia, and has made the prediction that the increasingly important functions assigned to measuring and automatic control instruments will be:

1. Minimizing the sum total of human drudgery, especially in eliminating repetitive operations and particularly in automatic dimensional gauging, automatic inspection of products, automatic grading, etc.
2. Creating new and better kinds of jobs.
3. Bettering working conditions.
4. Saving labor in the sense of increasing productivity, bringing about higher wages and lower prices.
5. Saving fuel and saving electric energy in utilization.
6. Saving materials.
7. Prolonging the service life of processing equipment.
8. Increasing production from processing equipment.
9. Accelerating modification of processing equipment for design controllability into production units.
10. Assuring better quality and uniformity of product.
11. Minimizing (sometimes eliminating) rejects.
12. Minimizing reliance on human watchfulness.
13. Preventing accidents.
14. Accelerating conversion of batch process to continuous.
15. Creating new industries; rehabilitating, expanding old.
16. Continuing improvements in meteorology, navigation, geophysical sciences, biological sciences, preventive and curative medical practices, and in numerous other non-industrial fields.

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1948:1949

Spectacular Growth in Natural Gas Usage

Sparks Industry to New Records at Year's End

By ROBERT W. HENDEE

DESPITE continuing shortages of steel and other vital materials which have retarded the planned expansion of its production and distribution capacity, the gas industry established several new records in 1948. More customers were served with gas than ever before. Output of gas attained a new high level, gas utility revenues reached an all-time peak and capital expenditures for construction and expansion of gas utility systems surpassed any previous figure in the history of the gas industry.

New processes for manufacturing gas discovered under the comprehensive research program being conducted for the entire gas industry by the American Gas Assn. already have brought about substantial decreases in costs of basic fuels for making gas with considerable increase in thermal capacity.

In the domestic field intensive research carried on by the gas industry and gas appliance manufacturers has resulted in refinements and improvements in gas appliances and in the utilization of gas that have served to increase the popularity of gas as the ideal fuel for home and industry. Coordinated advertising and promotional efforts on the part of the American Gas Assn., gas utility companies, gas appliance manufacturers and dealers brought the story of gas to the largest audience ever reached and resulted in record sales of modern automatic gas ranges. New records were set in the sale of gas refrigerators. Recently developed appliances broadened sales of gas in new domestic fields such as automatic gas laundry drying, gas incineration and all year gas air conditioning. A gas heat pump using latent heat in earth or water as a source for house heating was one of the year's outstanding developments.

With gas utility companies planning an expansion program calling for expenditures of $3.3 billion over the next five years, and with promotion, research and advertising programs continuing at an accelerated rate, it can be conservatively predicted that the year ahead holds great promise to continue the unbroken record of advancement of the gas industry.

Statistics

At the end of 1948 the gas utilities were serving 22,689,800 customers, including LP-Gas customers served directly by utilities, an increase of 4.1% over 1947. Of this number 12,242,500 were receiving natural gas, a gain of 13.3%; 8,369,000 were receiving manufactured gas, a decrease of 2.3%, and 1,756,200 customers were served with mixed gas, a decline of 19.6%. Approximately 320,000 customers received LP-Gas directly from utilities. Decreases in the manufactured and mixed gas customer groups are attributed to changeovers of important companies to straight natural gas during the year. In addition it is estimated that more than 4.5 million customers are being served with LP-Gas in territories not served by gas utility mains.

Utility sales of natural gas during 1948 were 2,802,079,200 Mcf. an increase of 11.4% over 1947. Manufactured gas sales amounted to 447,320,400 Mcf, a gain of 3.0% and mixed gas sales declined 15.1% to total 146,173,400 Mcf.

Total revenues increased 11.7% during the year to reach an all time peak of $1,559,624,600. The major increases occurred in the natural gas branch of the industry, although revenues of gas utilities serving both manufactured and mixed gas gained substantially in 1948.

New Facilities

Still limited by shortages of steel, the gas utilities in 1948 continued their increasing efforts to meet the ever-growing demand for gas. These utilities spent approximately $875 million last year in the expansion of production, transmission and distribution facilities, a figure which surpassed the previous record of $800 million spent in 1947. The increase in 1948 is especially noteworthy when it is remem-

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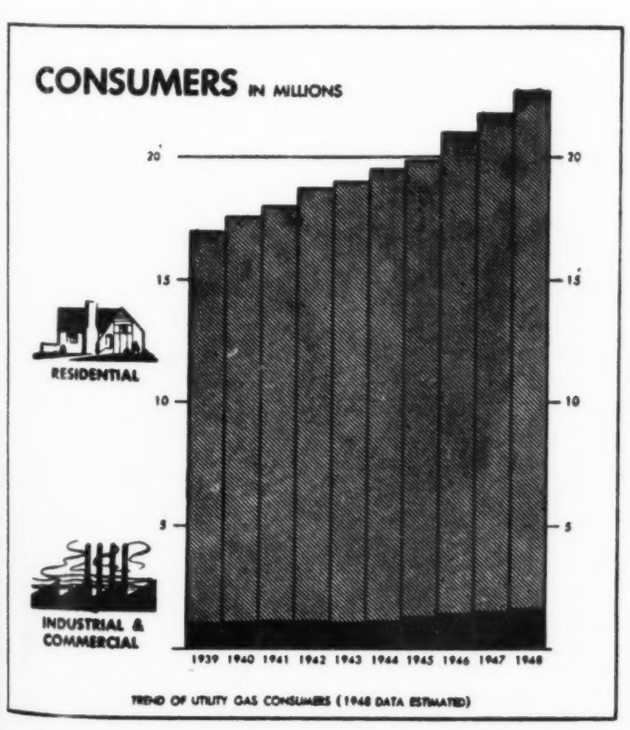
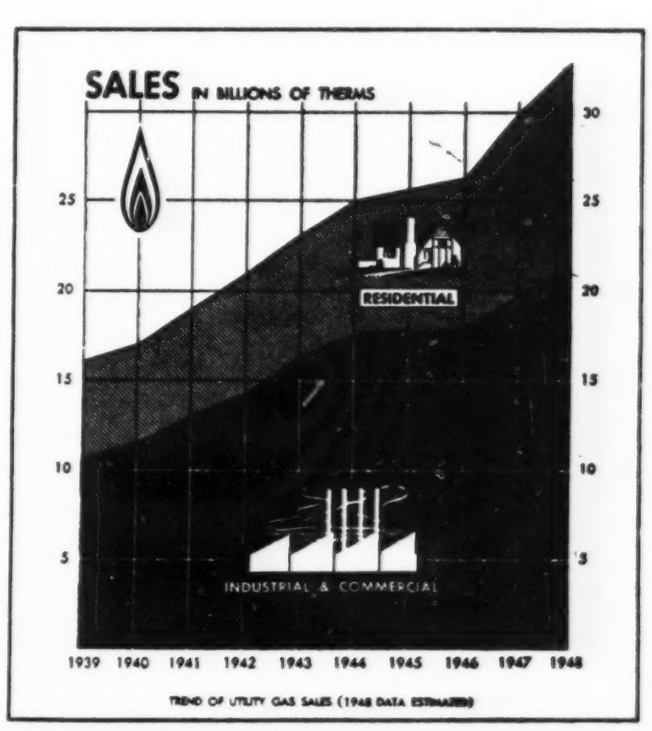




Mr. Hendee, currently AGA president, is president of the Colorado Interstate Gas Co., Colorado Springs.

Date	Applicant	Description of Construction	Purpose	Est. Cost	Communities Benefited (50,000 or more population)
Jan. 7, 1948	Home Gas Co., Mfrs. Light & Heat, Cumberland & Allegheny	For 65 miles of transmission and lateral lines and additions to compressor stations aggregating 2375-hp in New York, Pennsylvania and West Virginia.	To improve service to existing markets.	$ 2,690,164	Pittsburgh, Erie, Pa.; Wheeling, W. Va.; Binghamton, N. Y.
Jan. 8, 1948	Southern Natural Gas	For 215 miles of main line loops and laterals on present system, 19,000 compressor horsepower, miscellaneous facilities in Mississippi, Alabama, Georgia.	To increase daily system capacity from 255 MMcf to 384.5 MMcf in present area.	$ 13,296,610	Birmingham, Montgomery, Ala.; Atlanta, Columbus, Macon, Ga.
Feb. 2, 1948	East Tennessee Natural	For 187 miles of 16-in. transmission line, 112 miles of 12¾-in. line, and about 90 miles of miscellaneous laterals from TGT line extending to Chattanooga and Knoxville, Tenn.	For 64 MMcf for new customers in Tennessee, primarily Chattanooga and Knoxville.	$ 11,470,592	Chattanooga, Knoxville.
Feb. 19, 1948	East Ohio Gas Co.	For 84 miles of 20-in. line from a connection with the Big Inch in Monroe county to Stark county, Ohio.	For 130 MMcf daily additional from Big Inch lines.	$ 3,200,000	Akron, Canton, Cleveland, Cleveland Heights, Lakewood, Youngstown, Ohio.
Feb. 25, 1948	Mountain Fuel Supply Co.	For 37 miles of 10¾-in. loop line from South Salt Lake to Provo, Utah, laterals.	To supply natural gas to Provo and other communities in lieu of coke-oven gas.	$ 829,577	
April 7, 1948	Tennessee Gas Transmission	For 150 miles of 30-in. main line loops from Louisiana to Tennessee, 10,000 hp added to compressors.	To increase daily system capacity from 600 MMcf to 660 MMcf for existing customers.	$ 11,739,500	Pittsburgh, Erie, Altoona, Johnstown, McKeesport, Pa.; Chattanooga, Knoxville, Nashville, Tenn.; Wheeling, Charleston and Huntington, W. Va.
April 7, 1948	Hope Natural Gas	For 26 miles of 14-in. loop line on main line in West Virginia and addition of 3000 hp to compressor station.	To increase to 200 MMcf volumes of natural gas which it can take from Tennessee Gas Transmission for present customers.	$ 1,480,000	Pittsburgh, Erie, Altoona, Johnstown, McKeesport.
May 29, 1948 (amended Nov. 18)	Trans-Continental Gas Pipe Line	For 1760 miles of 26-in., 71 miles of 20-in., and 9 miles of miscellaneous line with 15 compressor stations aggregating 160,000 hp extending from Gulf Coast, Texas and Louisiana, to New York City and vicinity. Nov. 18 order allows substitution of 30-in. pipe for 1210 miles of 26-in.	Facilities with an initial daily capacity of 340 MMcf to deliver natural gas to Middle Atlantic Seaboard.	$191.310,154	Elizabeth, Bayonne, Camden, East Orange, Hoboken, Jersey City, Newark, Passaic, Paterson, Trenton, Union City, N. J.; New York City; Chester, Pa.
May 28, 1948	The Ohio Fuel Gas	For 28 miles of 20-in., 19 miles of 16-in., and 50 miles of 12-in. line to connect with West Ohio Gas Co. in Allen county.	To meet natural gas requirements of the existing markets, including 17 communities and two utility companies, and to improve general service.	$ 2,986,250	Columbus, Springfield, Dayton, Toledo, Cincinnati, Hamilton, Ohio.
June 11, 1948	Kansas-Nebraska Natural	For 274 miles of loop and transmission lines in Kansas and Nebraska, and additions to compressor stations of 1600 hp.	To increase capacity from 105 MMcf to 123 MMcf to meet increased peak needs in present area.	$ 3,121,133	
June 11, 1948	Panhandle Eastern Pipe Line	For 356 miles of 26-in. main line loops, compressor additions of 33,600 hp, appurtenant facilities in Texas, Oklahoma, Kansas, Missouri, Illinois, Indiana and Michigan.	To increase system daily capacity 102 MMcf to increase service to present customers.	$ 27,021,000	Decatur, Peoria, Springfield, Ill.; Fort Wayne, Muncie, Evansville, Ind.; Flint, Jackson, Kalamazoo, Lansing, Pontiac, Saginaw, Grand Rapids, Mich.
June 23, 1948	Chicago District Pipeline	For 41 miles of 24-in. line parallel to applicant's "Calumet Line" from Joliet to Chicago.	To increase reliability of service to present markets.	$ 4,000,000	Chicago, Cicero, Evanston, Oak Park, Ill.; East Chicago, Hammond, Gary, South Bend, Ind.
July 6, 1948	Alabama-Tennessee Natural	For a 10¾-in., 75-mile line, Selmer, Tenn., to Tuscumbia, Ala.; a 61-mile, 6⅝-in. line, Tuscumbia to Huntsville, Ala.; laterals.	To serve northern Alabama, Mississippi.	$ 2,900,000	

Date	Applicant	Description of Construction	Purpose	Est. Cost	Communities Benefited (50,000 or more population)
July 14, 1948	Lone Star Gas	For 2400-hp units in Fox station, Okla.; 3620-hp units in stations in Cooke, Knox and Grayson counties, Texas.	To increase capacity of system to meet increased demand.	$ 1,059,500	
July 15, 1948	Southern Natural Gas Co.	For 10,000-hp at two compressor stations; 6½ miles of 24-in. loops and a 4-line river crossing; 5000-hp compressor station; 5 miles of 8⅝-in. branch line looping, dehydration facilities in Gwinville field; taps, measuring stations.	To increase main line delivery capacity 35 MMcf, make better use of Gwinville reserves, increase delivery capacity of Meridian branch, serve 10 new towns.	$ 3,531,000	
July 26, 1948	Tennessee Gas Transmission	Substitution of 207 miles of 30- and 31-in. line for 213½ miles of 26-in. line previously authorized.		$ 3,935,000 (In addition to original project)	
Aug. 18, 1948	Texas Gas Transmission	For 3 1200-hp compressor units in Mississippi and Arkansas; a 2000-hp station in Louisiana; 1½ miles of 18-in. pipe.	To expand capacity of Memphis division by 15 MMcf.	$ 843,493	Memphis.
Aug. 20, 1948	So. Cal. Gas	For a 4 to 16-in., 73-mile line connecting with Texas-Calif. line near Desert Center, Calif., extending into Imperial Valley to Calexico.	To supply natural gas to customers now without service or receiving butane-air.	$ 1.150,000	
Aug. 26, 1948	New York State Natural	For a compressor station with six 600-hp units; 26 miles of 16-in. parallel; 24 miles of 16-in. line north from Rassalas, Pa.; 12 miles 16-in. line north from Hemphill, Pa.	To increase system capacity 19.7 MMcf daily.	$ 3,208,727	
Aug. 31, 1948	Texas Gas Transmission	For a 63-mile, 26-in. line from Lula, Miss., station to the system of the Light, Gas & Water Division of Memphis, Tenn.	An addition to Aug. 18 order. Emergency authorization to relieve gas shortage in Memphis during winter of 1948-49.	$ 3,287,763	Memphis.
Sept. 10, 1948	El Paso Natural So. Cal. Gas Southern Counties Gas	*El Paso:* For 450 miles of 30-in. loop from Lea county, N. M., to near Blythe; compressor facilities totaling 70,900 hp; additional lines. *SoCal and So. Counties:* For 88 miles of 30-in. loop for Blythe-Los Angeles line; 15 miles of 30-in. line from Rivera to a point in L.A.; addition of 4000 hp.	Will increase El Paso's delivery capacity 80 MMcf in Texas, N. M., and Ariz.; 100 MMcf a day at the Calif-Ariz. boundary for sale to SoCal and So. Counties; will permit sale of 17 to 31 MMcf to West Texas Gas Co. For California companies, will increase line capacity 100 MMcf.	*El Paso:* $ 56,000,000 *SoCal and So. Counties:* $ 10,040,000	
Oct. 14, 1948	Northern Natural Gas	For 28½ miles of 24-in. line, 17 miles of 20-in., 11,200 hp compressors.	To bring capacity of system north of Clifton, Kan., to 470 MMcf a day.	$ 4,311,000	
Nov. 4, 1948	Tennessee Gas Transmission United Gas Pipe Line	*Tennessee:* For 8 meter stations along line in northern Mississippi. *United:* For lines from Tennessee's line to each of 15 Mississippi towns.	*Tennessee:* For delivery to United. *United:* For resale of 8766 Mcf to United Gas Corp., an affiliate.	*Tenn.:* $ 16,000 *United:* $ 799,000	**Listed on this table are all major natural gas construction programs for which permanent authorization was issued by the Federal Power Commission from Jan. 1, to Dec. 15, 1948. Many other projects were given temporary approval in this period. This data, furnished by the FPC, was compiled in part by the GAS staff.**
Nov. 30, 1948	Southern Natural	For 8½ miles of 24-in. main line loops; 9 miles of 12-in. branch line loops; a 3-line, 12-in. river crossing.	Branch loop will increase capacity of Montgomery line by 3½ MMcf. Main loops will increase capacity between Birmingham and Atlanta.	$ 865,160	

(Continued from Page 29)

bered that the 1947 figure included $143 million for the purchase of the Big and Little Inch from the U. S.

Forecasting a continuation of this tremendous demand for gas, the industry has estimated its capital requirements for construction and working capital for the five year period 1948-1952 at $3.3 billion, with more than 90% of this amount to be expended for the construction of new facilities.

Natural Gas Expansion

The natural gas branch of the industry continued its spectacular growth. The Federal Power Commission, during the year, authorized the construction of approximately 8500 miles of new pipeline, bringing the total of natural gas pipelines in the United States to about 251,330 miles, exceeding the railroad mileage in the nation by 17,000 miles and oil pipeline mileage by more than 100,000 miles. In addition to projects already approved, applications pending before the FPC total an additional 14,600 miles. The largest single authorization by the commission was for construction by the Trans-Continental Gas Pipe Line Co. of a 1840-mile pipeline from Texas to New York City at an estimated cost of $189 million. This new line, estimated to be the longest and costliest natural gas pipeline in the world, will supply 340 MMcf of natural gas daily to gas utility companies in New York, New Jersey and Pennsylvania. Other important authorizations include those for the Texas Eastern Transmission Corp., which will add 1400 miles to its system, and the Tennessee gas transmission project, which includes a 1387 mile line from Texas to Pittsburgh. It is expected that total supplies of natural gas in the territories to be served by these lines will be increased 20%. More than $675 million was spent during 1948 on natural gas expansion and it is estimated that about $1,950,000,000 will be spent in the next four years.

Shortages of steel, particularly in 24-in. to 30-in. steel pipe, are handicapping the expansion programs of natural gas companies. Approximately 1,950,000 tons of steel were required for the 8500 miles of pipeline authorized by the FPC in 1948 and an additional 3,675,000 tons will be needed to complete the additional 14,600 miles for which certificates are pending. Soaring costs of materials and labor have necessitated raises in field prices of natural gas by a few producers. Transmission-line construction costs have climbed from a pre-war level of about $50,000 a mile to nearly $100,000 a mile today. While some field prices or delivery prices of natural gas have increased and some companies gave this as the reason for their rate increases, only 11 companies supplying natural gas reported rate changes in 1947 and only 5 thus far in 1948.

Proved natural gas reserves continue to gain despite the increased yearly consumption. The reserves committee of the AGA estimated that the proved recoverable reserves at the beginning of 1948 totaled 165.9 trillion cu ft compared with 160.6 trillion cu ft at the beginning of 1947. Although 5.6 trillion were produced during 1947, new discoveries and upward revisions of reserves in proved fields continue to exceed the rate of production and consumption of natural gas. Estimates of reserves have increased more than 700% since 1925 and more than 230% in the past ten years.

Manufactured gas companies in the east are evidencing increased interest in the importation of natural gas into their areas. Many are planning to use it to alleviate the problem of increased demands, instead of expanding their plants in the face of high construction costs.

Manufactured Gas

The record of achievement of the manufactured gas industry in the past year is an outstanding tribute to an industry that made substantial progress along a road beset with obstacles. The demand for gas in some manufactured gas areas continued to exceed production capacity. Expansion of production and distribution plants was limited by shortages of steel and other necessary materials. Rising costs of labor and gas making fuels narrowed, and in many instances eliminated, profit margins. More than 100 manufactured gas utility companies found it necessary to petition rate increases to offset these rises.

More than 50 manufactured gas companies have reported rate changes this year and most of these were rate increases. Regulatory commissions have been quick to recognize the urgency of the manufactured gas situation and authorization for increases in general have been forthcoming promptly following the presentation by the company of the facts with respect to the need for increased revenue.

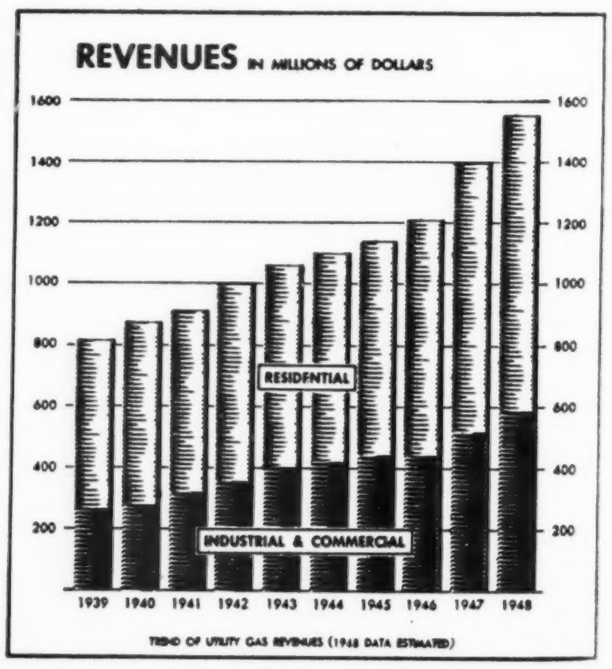
Despite serious handicaps the manufactured gas utilities registered gains in customers served, in volume sent out and in total revenues. Research projects carried on under the industry's accelerated research program will serve to aid the manufactured gas companies in meeting peak load and other problems.

Catalytic reforming of natural gas. propane, butane, and lower grades of gasoline to manufacture a low gravity carrier gas that can be enriched to produce any desired Btu content is one of the results of gas industry research that has helped to meet peak load problems. Plants to produce this type of gas can be located at strategic points in a gas utility's system and the finished product can be pumped directly into the company's mains without having to circulate through the main production plant. A plant of this type has been in operation in the Long Island Lighting Co. system and additional catalytic reforming plants are being installed in Pennsylvania.

TOTAL CUSTOMERS AND REVENUES (1947-48)

	1948	*1947*	*% Change*
Total	22,689,800	21,791,700	+ 4.1
Residential	21,076,400	20,259,200	+ 4.0
Commercial	1,498,400	1,423,800	+ 5.2
Industrial	96,300	92,100	+ 4.6
Other	18,700	16,600	.....

	1948	*1947*	*% Change*
Total	$1,559,624,600	$1,395,762,000	+11.7
Residential	972,210,700	869,501,000	+11.8
Commercial	209,861,800	182,962,000	+14.7
Industrial	357,467,500	325,642,000	+ 9.8
Other	20,084,600	17,657,000	.....



Industrial and Commercial Gas

Industrial and commercial utilization of gas has advanced in many industries during the past year, and developments in this field have kept the gas industry in the front ranks of the progress parade. In the automobile industry new applications of gas include gas-fired radiant tube furnaces for controlled atmosphere cycle annealing and gas-fired furnaces for rapid billet heating. Gas-fired ovens for baking and curing finishes gained in use by this and other industries.

A new use for gas offering service in municipal smoke abatement programs successfully incinerates smoke and industrial fumes. Textile processing through application of gas received increased favor and a new appliance uses gas as the fuel for applying latex coating for cotton tire fabrics. Last year witnessed the development of several types of gas-fired lumber kilns, a new utilization of gas which contributed materially toward the nation's housing problem. Through gas drying the time for seasoning green lumber is drastically shortened, greatly expediting the flow of lumber into construction.

Direct reduction and distillation of zinc ores by natural gas became an accomplished fact last year. The Bureau of Mines has issued several reports on this method which is now being used for the salvage of zinc residue and scrap.

Food service equipment manufacturers, profiting by the association's domestic research reports and from cooperative efforts from the utilization department of AGA have developed new appliances and improved the application of gas in others.

A new device that created much interest among restaurant operators during the year permits the cooking of several different foods at the same time. It consists of a display type of elevated oven with glass sides. Foods placed in holders or on spits revolve before radiant gas burners and are roasted nearly twice as fast as by conventional methods. Another new application of gas for commercial kitchens is a small steam cooker for preparing small batch of vegetables.

Commercial restaurant food sales now represent $7 billion annually, the third largest retail business in the country. In addition, much of the $5 billion annual income of hotels is derived from restaurant sales. These rapidly expanding industries require modernization as well as new construction and should bring greater sales of gas commercial equipment.

Testing Laboratories

The unprecedented demands for gas as a domestic fuel were apparent in the rapid expansion of testing activities at the association's Testing Laboratories in Cleveland and Los Angeles. This service reached an all-time peak in 1948.

More than 3000 different appliances were tested last year. While the bulk of this testing was handled at the main

NATURAL GAS

Customers

	1948	1947	% Change
Total	12,242,500	10,808,000	+13.3
Residential	11,330,000	10,000,000	+13.3
Commercial	856,600	761,000	+12.6
Industrial	45,300	39,000	+16.2
other	10,600	8,000	.....

Sales (Mcf)

Total	2,802,079,200	2,515,251,000	+11.4
Residential	881,830,600	740,572,000	+19.1
Commercial	262,071,600	224,295.000	+16.8
Industrial	1,558,652,800	1,467,504,000	+ 6.2
other	99,524,200	82,800,000	.....

Revenues

Total	$ 980,064,700	$ 848,316,000	+15.5
Residential	547,416,000	462,828,000	+18.3
Commercial	120,554,100	102,477,000	+17.6
Industrial	295,889.900	269,180,000	+ 9.9
other	16,204,700	13,831,000	.....

MIXED GAS

Customers

	1948	1947	% Change
Total	1,756,200	2,185,000	—19.6
Residential	1,655,600	2,053,000	—19.4
Commercial	88,700	117,000	—24.2
Industrial	10,800	13,000	—16.9
other	1,100	2,000	.....

Sales (Mcf)

Total	146,173,400	172,069,000	—15.1
Residential	89,987.000	113,969,000	—21.0
Commercial	23,107,400	24,778,000	— 6.7
Industrial	31,846,300	31,891,000	— 0.1
other	1,232,700	1,431,000	.....

Revenues

Total	$ 103,606,500	$ 122,136,000	—15.2
Residential	74,744,100	91,376,000	—18.2
Commercial	13,976,500	15,390,000	— 9.2
Industrial	14,319,600	14,695,000	— 2.6
other	566,300	675,000	.....

MANUFACTURED GAS

Customers

	1948	1947	% Change
Total	8,369,900	8,565,000	— 2.3
Residential	7,800,500	7,995,000	— 2.4
Commercial	524,500	525,000	— 0.1
Industrial	38,700	39,000	— 0.8
other	6,200	6,000	.....

Sales (Mcf)

Total	447,320,400	434,101,000	+ 3.0
Residential	300,593,700	291,274,000	+ 3.2
Commercial	73,907,300	68,566,000	+ 7.8
Industrial	68,603,600	69,723,000	— 1.6
other	4,215,800	4,538,000	.....

Revenues

Total	$ 459,754,800	$ 413,492,000	+11.2
Residential	338,639,200	306,980,000	+10.3
Commercial	71,272,900	62,134,000	+14.7
Industrial	46,764,600	41,404,000	+12.9
other	3,078,100	2,974,000	.....

Cleveland laboratories, the rapid industrial expansion of the Pacific Coast was reflected in the doubling of the laboratories' testing facilities there.

Testing of domestic heating appliances required an extra shift operation for their handling. An increase of 24% in furnaces and boilers tested was experienced over last year. Space heater testing increased 25% and 20% more domestic ranges were tested than a year ago.

Inspection services also increased with the test load. New factories and new companies producing approved appliances and accessories necessitated further extension of inspection activities, and more widespread checking of the equipment being produced in the field. Inspection at factories increased 22%. Production conditions and quality of equipment manufactured were found improved over 1947.

Approval Requirements

Revision, coordination and simplification of the standards on which the testing program is based was carried forward at an accelerated rate. Seven sets of revised requirements received the approval of the American Standards Assn. Inc. Covering new developments and improvements, they incorporated many technological advances made during the war period as well as experience gained in the field.

Research at the Laboratories

In the research field, efforts at the AGA Laboratories were devoted mainly to developing technical data to advance the methods of applying gas heat in appliances and to overcoming new conditions faced because of radical changes in home design and construction. Of special interest were studies of kitchen ventilation covering grease deposition and duct temperatures, performance of new types of forced-air furnaces intended for confined space installations, developments of heat transfer in central heating furnaces and research in possible improvements in counter appliances such as coffee urns, steam tables and dry-food warmers.

PAR Plan

The confidence of the gas industry in the association's coordinated program of Promotion, Advertising and Research was again demonstrated in the fourth year of the PAR Plan. The results of the expenditures in the fields of promotion, advertising and research more than speak for themselves. The PAR Plan is to be carried on next year at an accelerated rate when approximately $1.6 million will be devoted to these activities.

Research

General technical research projects carried on under the PAR Plan proved of special interest and potential value to natural gas and pipeline companies, as well as to the manufactured gas industry last year. Projects covering such subjects as removal of nitrogen and sulphur, corrosion and pipeline coatings brought specific help to gas utility companies.

More than a dozen Utilization Research Bulletins were issued as a part of the PAR domestic research program, informing appliance manufacturers and gas company technicians of the findings under these projects. Results already achieved have made possible improvements in burner design, controls, and in the utilization of gas appliances. Work done on mixed gas research has been summarized in the first of a series of comprehensive reports of great value to gas utilities faced with the problem of using standby fuels to meet peak loads.

Noteworthy progress was recorded in the field of gas production research during the year. Catalytic reforming of hydrocarbons advanced from pilot plant to actual operation by manufactured gas companies. A new regenerative process, the result of two years' work under the PAR Gas Production Research program, was brought to successful conclusion at the plant of the Consolidated Gas Electric Light and Power Co. of Baltimore. This process effected a saving of more than 30% in the cost of gas making fuels and increased thermal capacity of existing sets by 35% through the use of heavier and cheaper oils in manufacturing high-Btu gas.

STEEL HOLDS KEY TO GAMA MARKETS IN '49

Excerpted from a GAMA year-end report and Mr. Hendee's review.

Gas, today, is the cheapest form of energy. With natural gas reserves discoveries outstripping consumption and technology promising to reduce the cost of gas manufacture, limitless expansion is predicted for appliance and equipment manufacturers.

Under the stimulus of the first completely coordinated gas advertising and promotional campaign, automatic range sales in 1948 increased 300% over 1947 and sales of other types increased 25%, giving a new record total of 2.8 million sales. The previous year's record stood at 2,390,000. Automatic gas water heaters produced numbered 1.5 million, 300,000 off the 1947 record. Over 2.5 million space heaters were sold; of these, 300,000 were central heating units, less than half 1947's 750,000.

Shortages of both enameling sheet steel and pipeline steel, the latter bringing restrictions on house heating installations, were responsible for lags behind 1947 in certain categories. Nonetheless, between them the years 1947 and 1948 are credited with all the appliance sales records set to date.

In the new year, much will still depend upon the availability of steel. The vast majority of manufacturers do not believe they will receive a greater volume in 1949; many doubt if it will total as great as in 1948. GAMA refuses to make any sales forecasts, but does feel that a lifting of excise taxes, which are inflationary, would provide the industry a sizeable boost.

Manufacturers agree 100% on this: The sellers' market is over.

Natural gas lines now in construction will have little effect in 1949, because most of the large ones won't be completed for three or four years.

Intensified promotions on automatic gas ranges, totaling more than $8 million in consumer advertising and sales helps for dealers, will be continued in 1949.

Gas water heater manufacturers launched a 12-month sales contest for dealer salesmen on Jan. 1, 1949. This promotion is designed not only to promote unit sales through all types of outlets, but to acquaint dealers and customers with the need for larger size automatic gas water heaters to supply the increased demand for hot water created by automatic clothes washers, dishwashers, and the growing appreciation for ample supplies of hot water in the home.

An intensified sales campaign on Servel gas refrigeration, which will include salesmen's contests and increased consumer advertising, has been initiated for 1949.

Automatic domestic gas incinerators will receive greater promotion in 1949 than ever before. Emphasis will be placed on complete automatic controls, economy, health, and convenience.

Automatic gas clothes dryers, which are gaining great popularity as a companion piece to the rapidly selling automatic clothes washers, will receive widespread promotion during 1949, and will provide a new profit line for many dealers.

New developments in gas appliances which made their debut at the Atlantic City exhibition in October will help stimulate sales in 1949. Of note were the gas-fired heat pump . . . the new commercial barbecue device in which numerous different foods can be cooked simultaneously with materially shortened cooking time . . . a new bottle washer employing caustic solutions under pressure heated by gas . . . combination oil-gas burning house heating systems . . . a new type of water heater control with 100% shutoff and with the thermostat liquid bulb fastened outside the water heater . . . single point ignition . . . advanced design ranges, one with lever switches installed in the back splasher for safety, another with self-leveling broiler which can be adjusted without removing it from the oven. . . .

Projects in fluidization for the gasification of solid and fluid fuels are continuing and projects exploring other oil-gas techniques are being carried on that should benefit the industry.

National Advertising

The gas industry's largest single promotion of the year was the intensified drive in behalf of automatic gas ranges. This was a national cooperative project in which the association joined forces with 13 manufacturers, 200 gas utility companies, and several thousand dealers.

Spearhead of the campaign was the association's national advertising program. This was augmented and supplemented by national consumer advertising financed by manufacturers and a large volume of local advertising sponsored by gas companies and dealers. More than 10,000 newspaper ads on automatic gas ranges were published during the year, setting a new industry record in the volume of point-of sale advertising. Total investment of all interests in this coordinated campaign to promote automatic gas cooking has been estimated at $8 million. Results of this campaign are apparent in the greatly increased sales of automatic gas ranges.

In addition, the association continued its advertising program in behalf of gas fuel for industrial and commercial purposes most effectively since gains in these integrated fields were among the highest reported for last year.

Promotion

This year's advertising of automatic ranges was implemented greatly at the local level by the AGA Range Merchandising Campaign carried on under the association's promotional program. This program was broadened at the dealer level and approximately 165 gas utility companies are taking part in this effort to bring better gas ranges of all types to the attention of the consuming public.

The promotion "Hot Water Magic" earned the participation of about 170 gas utility companies and the support of many of the 42,000 water heater dealers in the United States. This program was a forerunner of an integrated national advertising and promotional campaign on water heating to be carried on next year.

"Winning Seals of Approval," the industry's motion picture film in full color presenting the story of modern automatic gas ranges through the AGA Laboratories seal of approval and "CP" seal of performance, is currently being shown in about 500 schools per month, and the picture story book "History of Gas" has reached more than 750,000 students.

In cooperation with the national recruitment program designed to help meet the rapidly increasing need for trained home economists, the home service committee of the association produced in 1948 a series of career recordings entitled "Home Economics For Me." These records were made available by local utility companies and attracted much attention by educators as the means of attracting many students to this important profession.

Technical Developments

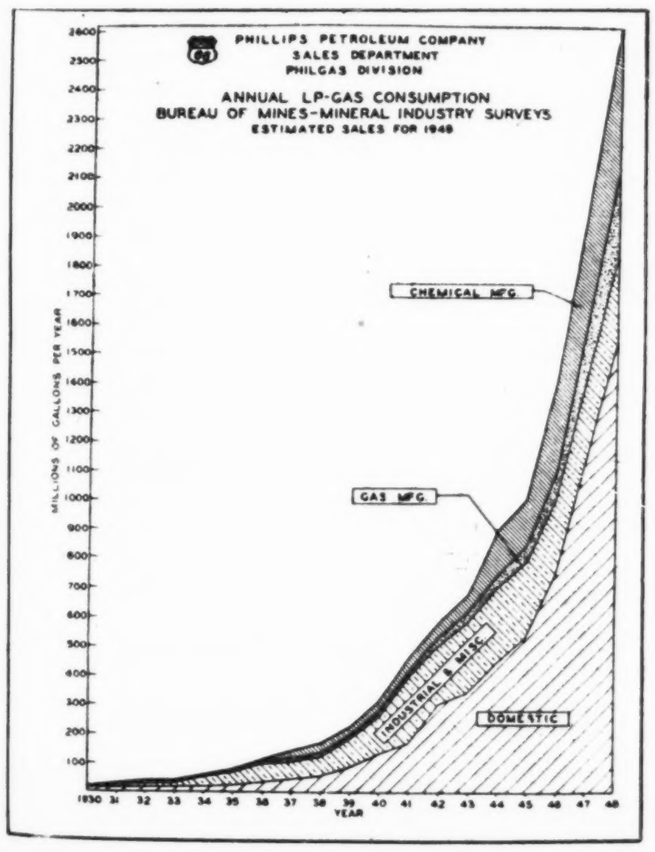
Several of the technical advances made by the gas industry in the past year have been mentioned earlier in this report. Corrosion and purging problems have been studied and progress reported toward their solution.

The trend toward mechanization has extended toward every phase of the gas business, since it is a vital factor in helping utilities meet continuing high costs of labor and materials. Growing demand for radio communication as an essential part of the gas industry's transmission and distribution systems spurred efforts on the part of the industry to obtain unimpaired mobile radio channels in the interests of efficiency and safety.

Year's Increase in LP-Gas Sales Tops Total 1942 Output

By K. W. RUGH and E. O. MATTOCKS

DURING 1948 the liquefied petroleum gas industry continued the steady growth which it has consistently shown during the past decade. In spite of various obstacles placed in its path the rate of growth has been reasonably uniform. It is estimated that during 1948 the total volume of liquefied petroleum gas marketed will have reached a total of 2.6 billion gal. This represents a 29.5% increase over the volume sold in 1947. The increase in 1948 in marketed LP-Gas over that marketed in 1947 was greater than the total quantity of liquefied petroleum gas marketed during 1942. The 1948 volume is equal to 24% of the total LP-Gas marketed since 1930.



The estimated volume of LP-Gas sold for domestic purposes in 1948 is 1,540,000,000 gal. This represents an increase of 33.9% over that consumed for the same purpose in 1947. The total quantity consumed for domestic purposes in 1948 is greater than the total quantity of LP-Gas sold for all purposes in 1946, just two years previous. The large demand for this product for homes, farms, institutions and commercial establishments located beyond the gas mains is clearly indicated. This domestic requirement is made up of two different demands: The first results from new consumers added during the year who previously have used other types of fuel or whose fuel requirements represent an entirely new demand, such as for a new home; the second results from the increased usage by old customers.

It is estimated that more than 25% of the gas ranges produced in 1948 went into the LP-Gas market. The demand for LP-Gas automatic water heaters and refrigerators continues to increase. Space heating with LP-Gas is enjoying a greater popularity than ever. All of these demands are the result of the satisfaction which consumers are enjoying from the use of LP-Gas. It is estimated that there are now about 5½ million homes using LP-Gas. It is also estimated that one-third of these use LP-Gas for space heating as well as for the other house-

The authors are, respectively, manager, Philgas Division, and technical representative, chemical engineering dept., Phillips Petroleum Co.

1948 1949

MARKETED PRODUCTION OF LP-GAS

Year	Total Sales: Gallons (in thousands)	Total Sales: Per Cent Increase	Distribution — 1000 Gal.: Domestic[1]	Per Cent Increase	Ind. and Misc.[2]	Per Cent Increase	Gas. Mfg.	Per Cent Increase	Chemical Mfg.	Per Cent Increase
1922	223	.....	(Sale of liquid petroleum gas confined primarily to bottled gas business prior to 1928)							
1928	4,523	314.6	2,600	.....	400	.....	1,500	.....	.....	.....
1930	18,017	81.4	11,800	100.0	2,200	46.7	4,000	60.0	.....	.....
1940	313,456	40.2	134,018	53.1	124,482	34.5	20,285	31.4	34,671	29.0
1941	462,852	47.7	220,722	64.7	172,669	38.6	25,255	24.5	44,206	27.5
1942	585,440	26.5	303,857	37.3	197,149	14.3	31,366	24.2	53,038	20.0
1943	675 233	15.3	344,962	13.7	237,396	20.2	37,518	19.6	55,356	4.4
1944	898,071	33.0	445,617	29.0	254,590	7.3	45,879	22.3	151,985	175.0
1945	1,067,979	19.0	533,262	19.7	256,577	0.8	53,849	17.4	224,291	47.5
1946	1,410,370	32.1	758,466	42.2	253,745	—1.1	86.660	61.0	311,499	38.8
1947	2,008,262	42.4	1,150,538	51.7	274,125	8.0	169,332	95.4	414,267	33.0
1948	2,600,000	29.5	1.540,000	33.9	280,000	2.1	280,000	65.4	500,000	20.7

1. Household use plus other requirements by these customers such as irrigation pumping, tractor fuel, flame weeding, chicken brooding and similar uses. Included also is LP-Gas sold by domestic distributors but used for industrial purposes, internal combustion engine fuel and for gas manufacturing purposes.

2. Includes LP-Gas sold for fueling internal combustion engines.

3. Not comparable due to segregation of chemical manufacturing.
Remarks: In this table total sales for all years except 1948, were obtained from U. S. Bureau of Mines reports. Distribution for the years 1931 to 1947, inclusive, was obtained from the same source. All other volumes were estimated by the writers. The total sales volume includes all LP-Gas (propane, butane and propane-butane mixtures) when sold as such. Until 1944 the sale of pentane when sold for any purpose other than fuel blending was included. Since then it has been excluded. It does not include butane when blended with heavier petroleum fractions for motor fuel purposes. Intercompany sales transfers such as purchases of LP-Gases by one company from other companies and resold as LP-Gases have been eliminated in order to avoid duplication of sales figures. The data do not reflect sales of LP-Gases used directly by the producer at the point of production for fuel polymerization, solvent dewaxing, etc. Neither do the figures include sales of hydrocarbons to plants manufacturing synthetic rubber or aviation gasoline or their components.

Note: This table has been briefed down with the omission of the years 1923-27, 1929, and 1931-1939. Readers interested in obtaining the full story since 1922, the first year LP-Gases were marketed, are directed to the January, 1947, issue of *GAS* (p. 35).

hold purposes. There are presently installed more than 3000 bulk plants, a number which is about equal to the number of counties in the U. S.

The amount of LP-Gas marketed for industrial and miscellaneous uses during 1948 is estimated at 280,000,000 gal. One of the most rapidly growing uses for LP-Gas by industrial plants is for standby to other fuels, generally manufactured or natural gas. To insure against an interruption of gas supply, a large number of industries have installed LP-Gas as a standby fuel. These installations furnish varying percentages of the total gas load, in many instances supplying complete replacement with LP-Gas-air mixtures.

The use of LP-Gas in gas manufacturing installations continues its rapid increase. It is estimated that 230 million gal were used in 1948 for this purpose. This is an increase of 65.4% over 1947. The increased distribution of natural gas throughout the country has in many instances resulted in excessive space heating demands during the winter months. LP-Gas is used to a great extent to augment both natural and manufactured gas supplies during peak loads. A controlled amount of LP-Gas and air may be mixed directly with manufactured gas without encountering burner operating difficulties, but the reforming of LP-Gas to produce a substitute gas is permitting even greater quantities to be used. LP-Gas is used generally not only to feed the reforming units but also to enrich the produced gas to the desired heating value. Large proportions of LP-Gas and air mixtures may be mixed with natural gas or in some instances may replace natural gas completely without causing any unusual burner operating difficulties. The installation by utilities of large new standby units or additions to present installations has continued throughout 1948. Almost 400 towns are now served with LP-Gas exclusively.

The volume of LP-Gas used for chemical manufacture is one of the most difficult to estimate. LP-Gas is used as an intermediate product which is processed to some other product, the latter serving as an ingredient of a required chemical. Large quantities of LP-Gases in the gaseous form are furnished direct to chemical companies through pipelines from the source of production. In a number of cases, these gases are composed largely of olefins—unsaturated hydrocarbons. It is estimated that 500 million gal will be used in 1948 for chemical manufacturing purposes. This represents an increase of 20.7% over 1947.

During 1948 great results have been accomplished in increasing the storage capacity at consumers' installations, providing gas for house heating during peak demands when requirements exceed production. Transportation facilities, both tank car and transports, have been increased in adequate number to handle the increased amount of LP-Gas marketed. The pipeline movement of LP-Gas to the domestic, industrial and utility markets is increasing and during the year a major marketer completed a finished petroleum products pipeline through which propane and butane are transported.

New sources of production of liquefied petroleum gas together with the enlargement of existing producing facilities have increased the supply of LP-Gas during the past year to keep pace with the increase in demand.

The acceptance, by most of the states in the United States, of the National Fire Protection Assn. Liquefied Petroleum Gas Code which is generally referred to as the National Board of Fire Underwriters' Pamphlet No. 58, entitled "Standards for the Design. Installation and Construction of Containers and Pertinent Equipment for the Storage and Handling of Liquefied Petroleum Gases as Recommended by the National Fire Protection Assn.," indicates the general acceptance of this code as the basis for standards of safety.

Economies, operating data, and the place of water gas among fuels of tomorrow

Developments and Trends in Water Gas Operation

By PHILIP T. DASHIELL

THE water gas process using air for blast and oil for carburetting must be cyclical. Maintenance of optimum fuel bed temperature continuously is therefore impossible. The nearest approach thereto can be had by using the shortest practical cycle with proper relationship between steam and air.

Because the steam carbon reaction is practically absent below 1200°F the fuel bed must be above that, and the hotter it is the more rapid will be the evolution of blue gas.

It is generally considered that the rate of blue gas production depends upon the temperature of the hot zone near the grate. That is true, but it has been shown that the rate of steam conversion in the hot zone is less than in the zones just above it. A hot zone of high temperature means a wide zone of a little less high temperature above it. The percentage of carbon in the hottest zone is low. Just above it the fuel bed is rich in carbon and while the temperature in the broader upper zone is lower than in the hottest or clinker zone, the rate of steam conversion is highest there and gradually tapers off above that.

During the run period the temperature of the fuel bed falls rapidly. For that reason the maximum rate of production occurs in the first few seconds (about 10 seconds) of a run, is low at the time of reversal, increases again during the back-run, but never again approaches the rate obtained in the first few seconds and reduces to almost nil again at the end of the run.

The above statement is based upon observation of a meter located just after the condenser and receiving the gas from a single large water gas set.

In the process the reversal of steam flow has a dual purpose:

1. It makes use of the heat transferred during the up-run from the lower portion of the fuel bed toward its upper portion, and
2. It again transfers heat before the beginning of the blow to the lower zone in order to *maintain highest temperatures* there, thus completely burning out the carbon there and fusing its ash to clinker sufficiently near the grate to make periodic or continuous clinker removal relatively easy and complete.

It should be pointed out here that moderately high temperatures in a fuel bed and high capacities of gas production cannot exist together.

Because the rate of production of a water gas set depends directly upon the rate of evolution of blue gas during the run period and because this in turn depends not only upon the amount of heat stored in the fuel bed but upon the temperature of the carbon of the fuel bed, high blasting rate with short cycle is required where high production rate is the objective.

No one knows at this time what the ultimate capacity of a water gas generator of given diameter may be under optimum conditions. For, on account of a number of limitations, not all of which have as yet been eliminated, maximum capacity has not been reached.

The writer made a report to the production research committee, which appeared in *AGA Monthly* in 1945, in which were given the results of test runs on large water gas sets in an attempt to discover and possibly remove some of these limitations.

In that particular situation a generator or primary blast rate of 20,000 cfm was used without complication.

A rate of 23,000 cfm could have been used but when that was done there was a tendency to lift the fuel bed and blow over into the carburettor objectionable amounts of small coke.

This was caused largely by the fact that in the cycle of operation the secondary air blast valve closed just before the generator blast valve, causing an upsurge in the blast rate to 28,000 cfm.

I would like to point out that in this particular instance the rates quoted approached the practical limit. There is a device now procurable which will eliminate the surge, which was not available at the time. Since installed

on some of the sets, it has allowed higher blasting rates than would otherwise be allowable.

The use of high blasting rates also requires the ability to obtain a high rate of steam admission during the run period of a short cycle.

Generally speaking, with coke of 8% to 9% ash and ash fusion point of 2500° to 2600°F, an air-steam ratio (i.e., cu ft of air per pound of steam) of between 40 and 50 will be required to keep clinker conditions satisfactory and give maximum production rate per day.

In the writer's experience the blast

This paper was presented before the meeting of the operating division of the New England Gas Assn. at Worcester, Mass., Oct. 21. The author is associated with United Engineers and Constructors Inc., Philadelphia.

and steaming rates quoted are the highest used.

It is well known that in many older installations such rates are not possible because of many physical obstacles such as inadequate blowers, blast main, connections between shells, steam lines, gas off-take piping, etc. In many cases some of the limitations usually called "bottle necks" are removable or at least capable of considerable improvement with resulting increase in capacity at reasonable cost. In most of the older plants, production is low per square foot of generator grate space as compared with modern plants.

In the specific case alluded to above, production rate by a set having a 9-ft diameter mechanical grate with center cone or tuvere for blast admission made in 22.5 hrs running time per day, 10,119 Mcf of 529-Btu .7 sp gr gas—over 7 Mcf per sq ft of grate per hour. These results are average for a 14-day test run.

In terms of thermal capacity per set day this is a little over 53,000 therms per 24 hours. It would have been quite possible to increase the calorific value of the make gas to 600 Btu and to have produced 60,000 therms per day with those sets.

In certain newer installations of water gas sets these figures of capacity are now being approached or exceeded.

In few, if any, older installations are such rates of production possible. It is useless to state set capacity on a shell diameter basis because quality of feed stock has a great bearing on production rate. Any statement of set capacity should be qualified by a statement of the quality of the feed stock, both coal and oil, as well as the shell diameter.

In the production of carburetted water gas the fuel bed is required not only to store as much heat as possible but to supply combustible blast gases to be burned in secondary combustion to heat the oil vaporizing and cracking surfaces of the carburettor and superheater. This is another limitation to the blue gas production capacity of the generator which in a three-shell setup cannot be changed to any great extent. To reach the capacities shown above, ample oil heating surfaces must be available. Often in old installations there is greater capacity for oil cracking than is at first apparent.

The gasification of oil depends upon at least three factors: (1) the temperature of the heating surfaces, (2) the time contact, and (3) the excess steam present. All bear upon the actual input of heat to the oil in its passage through the set.

Of the total heat required to gasify oil in the carburetted water gas process, about 60% is required to vaporize and 40% actually to crack the vapors to permanent gases.

Generally speaking, in present day practice, because of high production rates, short time contact and the fact that much of the oil available to us is partially cracked material, higher temperatures are required in the oil cracking surfaces than was the case a few years ago.

The best indication of thorough oil cracking is gained from regular examination of the tar produced, especially the sulfonation residue thereof. High sulfonation residue means insufficient heat treatment of the oil. It is a very common fault. It often causes the formation of objectionable tar emulsion difficult to dehydrate.

Natural Gas In Picture

THERE is great activity these days and actual accomplishment of the delivery of natural gas from Texas to locations on the Eastern seaboard.

For the operators now making and distributing carburetted water gas, there are many advantages to be had through judicious use of natural gas for reforming it in their sets to 350 to 400 Btu and enriching the reformed gas with natural to meet the calorific value and specific gravity required.

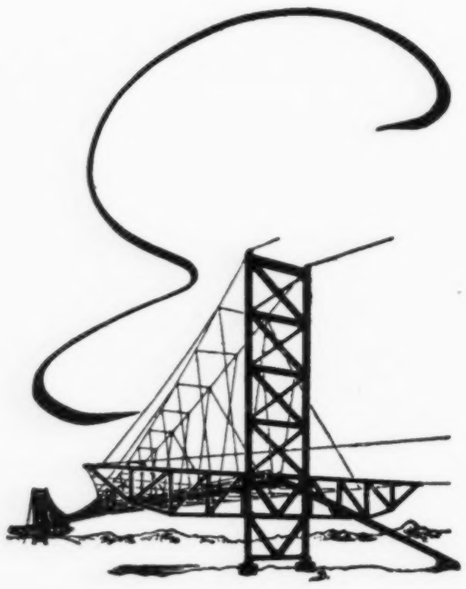
A therm of natural gas is now cheaper than that obtainable in the form of any petroleum product.

The capacity of a given water gas set will be markedly increased.

It is more than probable that in the next few years its use as referred to above will be much further expanded and may reach most of the gas production centers of the Eastern section.

This does not mean, as I see it, the scrapping of water gas plants. Water gas sets will be more active and produce more town gas than ever before.

The widespread use of natural gas will cause a great reduction in the volume of enrichment oil now used in carburetting water gas. It is probable, however, that this will not result in a general lowering of oil price. Not as long as the price of coal remains as it is now.



It is well to understand that the whole gas industry uses a volume of oil for gas enrichment which is of minor importance to the oil refining industry. A change in demand up or down on the part of the former will have little effect upon refinery practice or prices. The material used by gas companies—cracked distillate and bunker oil—is sold at a price competitive with diesel fuel, domestic heating oil, industrial fuel oil or at its value to the refiner himself for recycling. Fortunately the water gas process can use oils of a very wide range of quality.

In my opinion, there will be in the foreseeable future sufficient oil to meet the requirements of the gas industry. Straight run gas oil of high enriching value will not be available in quantity. Residuums of refinery processes and partially cracked distillates, derived from the catalytic processes for the manufacture of gasoline, will be the principal source of supply. The prices will continue high as long as that of coal remains up. There may be a contrary effect on the price if production increases and gets out of balance with the demand for petroleum products as was the case in the years 1929-1940. During that period before catalytic cracking came into general use, such a condition existed in the heavy fuel oil market bringing with it low prices and a great advantage to our industry.

There seems to be no indication now of the return of such a condition.

In connection with the use of natural gas in our operations in the East, far removed from the source of the gas, it seems wise to use reforming and cold enrichment and to continue to distribute gas of calorific value somewhere near the existing standard or, in other words, to continue to distribute a gas which can be made, in required volume and quality, in the existing gas plants.

On the other hand, if as has apparently been the case in some situations, it is necessary in order to meet increasing demand for gas, that gas of higher Btu (perhaps double that now being sent out) be distributed, natural gas may be distributed as such.

In such a situation it seems wise to maintain the existing plants in good operating condition but to rearrange the generating equipment, adapting it to use one or the other of several processes for making high Btu oil gas of 1000 Btu or thereabouts.

Present at the annual meeting were (l. to r.) R. J. Spaeth, H. T. Heald, F. C. Smith, W. Sykes, L. Ruthenburg, L. L. Tonkin, R. E. Kruger, J. E. Heyke Jr., G. Smith, F. H. Adams, G. Creelman, E. H. Eacker, C. J. Shuttleworth, H. B. Noyes, G. Mitchell, C. B. Dushane Jr., F. H. Lerch Jr., N. H. Gellert, D. K. Taylor, M. L. Sperry, W. R. Wright, J. D. Parent, J. D. Cunningham, and E. S. Pettyjohn, director of the institute. Also present, but not shown, were Thomas Drever and Harry Clark. Trustees were elected at the meeting.

Gas Institute Breaks Ground for New Home

CEREMONIAL ground-breaking for the Institute of Gas Technology's new building was held late in October at the seventh annual meeting of members of the institute in Chicago. The meeting also featured an address by Frank C. Smith, president of the Houston Natural Gas Corp., and the election of new trustees.

The symbolic first spadeful of earth was turned by Frank H. Lerch Jr., president of Consolidated Natural Gas Co. and re-elected chairman of the board for the institute. The new building will be two stories high, with a full basement, and will be 180 ft long by 75 ft wide. It will house the institute's precision laboratories, some of its research laboratories, information service, classrooms, library, and administration and business offices.

Cost of the building is estimated at $400,000, with equipment swelling the total investment to more than $750,000. It will be paid for by contributions from gas companies all over the nation. Under the direction of the AGA's PAR committee, funds are being solicited over a three-year period, with the contributions for the first year (1947) totaling $137,500. Construction is scheduled to begin early next spring. *(For a detailing of the institute's operations see GAS, September, 1948, p. 50.)*

In his speech, Mr. Smith covered circumstances surrounding the founding of the institute, restated its purposes and functions, examined its past and present work and its educational program, and surveyed its many accomplishments. He gave close attention to the sponsored research work it is doing for the AGA, and the institute's very practical value to the gas industry.

His keynote address stressed the institute's future:

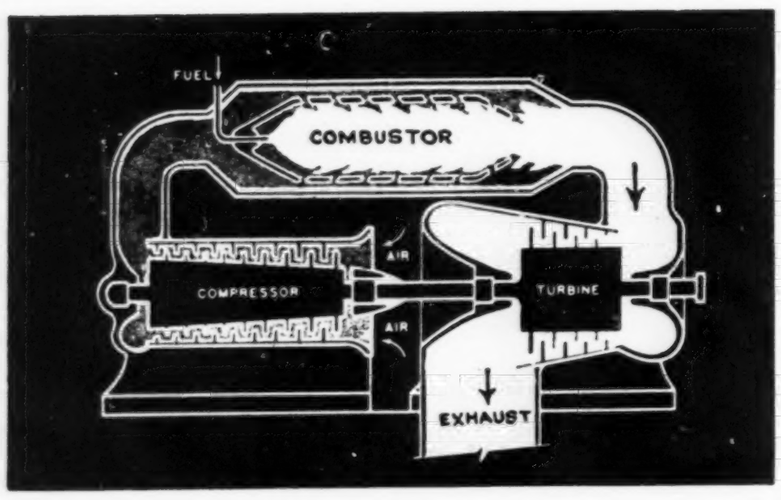
"The wisdom of the long pre-organization period of advance study and planning is now evident. . . The institute now faces the future with confidence, aspiring only to serve the industry to its fullest potential, and welcoming every opportunity to fulfill its dual functions of education and research in behalf of the gas industry of our country."

Dr. Henry T. Heald, president of the institute and of Illinois Institute of Technology, presided at the morning meeting at which time it was voted to increase the number of trustees from 22 to 28 and increase the representation of IIT trustees on the board from four to five.

Men elected as trustees were:

(Term expiring 1949) Henry Fink, president, Michigan Consolidated Gas Co.; (term expiring 1950) Harry K. Wrench, president, Minneapolis Gas Co.; (term expiring 1951) F. M. Banks, vice president, Southern California Gas Co.; Henry R. Cook Jr., vice president, Consolidated Gas Electric Light and Power Co. of Baltimore; James D. Cunningham, president, Republic Flow Meter Co.; E. H. Eacker, president, Boston Consolidated Gas Co.; R. H. Hargrove, president, Texas Eastern Transmission Corp.; James F. Oates, chairman of the board, Peoples Gas Light and Coke Co.; Marcy L. Sperry, president, Washington Gas Light Co.; Paul R. Taylor, vice president, Consolidated Electric and Gas Co.; and George S. Young, vice president, Columbia Engineering Corp.

Witnessing Frank H. Lerch Jr. break ground for the institute's new building are: (foreground) Frank C. Smith, president, Houston Natural Gas Corp.; H. T. Heald, president of the institute; and Institute Director E. S. Pettyjohn. Industry representatives in the background include H. B. Noyes, gen. supt., Washington Gas Light Co.; L. L. Tonkin, pres., Hope Natural Gas Co.; John E. Heyke Jr., v.p., Brooklyn Union Gas Co.; George Smith, asst. mng. director, AGA; Bernard Franck, v.p., Minneapolis Gas Co.; Louis Ruthenburg, pres., Servel, Inc.; N. Henry Gellert, pres., Seattle Gas Co.; M. L. Sperry, pres., Washington Gas Light Co.; Frank H. Adams, v.p., Surface Combustion Corp.; E. H. Eacker, pres., Boston Consolidated Gas Co.; and Harry Clark, representing Rockwell Manufacturing Company.



Gas Turbogenerators To Prove

LAST MONTH Thomas J. Putz discussed a 2000-hp oil burning gas turbine generator set which was scheduled to go into service driving a compressor on the main line of Mississippi River Fuel Corp. (p.47). In this article Mr. Hall, Mid-Continent editor of GAS, tells of two new gas turbogenerators, one a simple cycle, the other a regenerative type, both powered with gas, which are to be installed by electric utilities in Oklahoma to augment present steam-powered facilities.

AN important new market for natural gas will develop in its use as fuel in gas turbogenerators, the first of which is scheduled for installation in the Arthur S. Huey power station of the Oklahoma Gas and Electric Co. at Oklahoma City next April. How extensive this market will be depends on the degree of success of the new installation and how generally the gas jet engine is accepted by the electric industry as a source of power for operation of electric generators.

Exclusive

The Public Service Co. of Oklahome at Tulsa also has ordered two of the gas turbogenerators for installation later in 1949 in two of its power plants, probably those located in western Oklahoma.

Economies Expected

If expectations of both electric utilities are realized important economies will be realized in the production of electricity by adoption of the gas jet turbine principle.

The General Electric Co., which designed the units, has been conducting research in gas turbine development since 1904. From this beginning the company developed the turbosupercharger and five designs of aircraft gas turbines which power jet-propelled airplanes. Adaptation of the gas turbine for requirements of electric power generation—bringing the jet engine "down to earth"—has required years of careful engineering.

Otis Howard, assistant operating general superintendent, Oklahoma Gas and Electric Co., says that his company will require thorough tests of the unit it has ordered to make sure of its most efficient operation on natural gas before it is installed. These turbines also can be operated on diesel fuel and oil. The type to be installed by the Oklahoma Gas & Electric Co. is known as the "simple cycle" generator and has a rated capacity of 3500 kw. The units ordered by the Public Service Co. of Oklahoma are of the "regenerative-cycle" type, with greater claimed efficiency but more complex construction.

The regenerative cycle type which the Tulsa utility will install consists of two gas turbines, one driving a low-pressure air compressor and the other driving a high pressure air compressor. The high pressure turbine will also drive a conventional steam turbine-type generator.

This new type of gas turbine-generator differs from the simple cycle type, previously built, in two ways: (1) by using intercoolers between the two stages of compression to reduce the power requirements of the compressors and (2) by utilizing the waste heat from the exhaust in a regenerator to increase efficiency. The simple cycle types do not use an intercooler or a regenerator but use a heat exchanger. The new design to be installed by the Public Service Co., it is claimed, will represent marked savings in fuel economy.

The Oklahoma Gas & Electric Co. chose the simple-cycle type because of its simpler construction and because after an extensive survey it was found to be the most suitable for the Huey station, which is principally a steam plant. Although it is rated at 3500 kw, it was found that it would produce a combined station capability increase in excess of 6000 kw and, if fully expanded by adding two more gas turbine units, would raise station capability by a total of 15,500 kw. The additional capability is produced at a heat rate lower than the present base station heat rate in the steam plant.

The necessity for enlarging the generating capacity of the Huey station, involving heavy costs for installation of new boiler capacity and expansion of the building, caused management and engineers at OG&E to investigate the gas turbogenerator. It was found that enlargement of the building and equipment to handle the added steam capacity would cost more than $500,000 and that the added steam plant would require three times as much space as the gas installation. While two men would be required to operate the steam or diesel plant, one attendant could handle the jet gas plant.

Factors Considered

The big factor which was considered by both the OG&E and Public Service was that many times as much water would be required to operate a steam plant as was required by a gas turbogenerator. Furthermore, the steam turbine, it is claimed, would represent five times the weight in machinery. With not too much water available in Oklahoma at times and with a scarcity of steel these considerations were deemed important. Then there was the matter of obsolescence to consider. What would be the prime fuel in the electric generating picture 25 years hence? Would it still be steam or would it be gas jet engine—or even the beginning of applied atomic power? The management and engineers thought that the best bet would be the gas turbogenerator, not only from the standpoint of holding down the costs of generating electricity but from the viewpoint of obsolescence possibilities.

An abundance of low-cost, high-Btu natural gas in Oklahoma and many of the other states and favorable conditions for working the gas turbine into the existing Huey plant heat balance made the gas installations attractive to the electric company, following exhaustive studies.

ectric Power in Oklahoma

By O. D. HALL

Present heat balance of Huey station includes three boilers and two steam turbines with regenerative feed heating. It was found that installation of a simple-cycle gas turbine, operating on natural gas and equipped with an exhaust-gas-recovery heat exchanger, would produce a combined station capability increase of more than 6000 kw, and if fully utilized by adding two more gas turbine units would increase the station maximum capacity by 15,500 kw. Exhaust of the gas turbine will pass through the heat exchanger, heating feedwater that has by-passed the turbine closed heaters, thus raising the steam-turbine kilowatt output.

The gas turbine doesn't require steam and will therefore not need large amounts of water as does the steam turbine. It will operate by a mixture of gas and air at high pressure and high temperature. Compressed air is taken to a combustion chamber into which fuel has been injected. The burning fuel raises the temperature of the compressed air, which is forced against the turbine wheels at a high temperature and high pressure; and they in turn operate the electric generator. The unit requires no boiler and the efficiency and economy, it is believed, will be much greater than that of the larger steam-driven unit. Thus the overall operating cost of the company's power generating system can be kept down.

The gas turbine exhaust temperature is limited by the manufacturer to a maximum of 780°F. The high exhaust gas temperature makes it attractive for reclamation of heat for feedwater.

The gas turbine at Huey station will be housed in an inexpensive building added to one side of the existing plant. Natural gas will be supplied to the unit at a minimum pressure of 100 psi. Use of a minimum open-cycle hookup such as will be made by the OG&E permits a simple, lightweight and inexpensive design. The turbine, direct connected to the compressor, runs at 6700 rpm. A precision helical gear couples the turbine to a conventional 4000-kw, 3600-rpm generator and exciter.

Atmospheric air enters the compressor to be raised to about 87 psia at full load. The high pressure air then enters six cylindrical combustors where burning fuel raises the temperture to that required for the load. With the essentially constant air flow, turbine inlet temperature will vary directly with load. Hot high-pressure gas then expands through the turbine.

The axial-flow compressor has 15 stages, for a compression ratio of about 6:1. Tests are being made in Schenectady on Bunker C and diesel oils, but the OG&E and Public Service Co. units will use natural gas. To make sure that no fundamental problems will be involved with natural gas, tests will be made using combustors fired by the latter fuel.

Air from an intermediate stage of the compressor cools various parts of the turbine.

The exhaust-gas heat recovery unit is about 16 ft long, 14 ft wide and 8 ft high. The complete compressor and gas turbine unit weighs only about 20,000 lb.

The engineers do not claim that all the problems connected with the use of natural gas in gas jet turbine units for generation of electricity have yet been solved, as this method has never been tried in actual operation. Increasing the efficiency of the units to handle low Btu content gas is one of the problems. Stepping up the heat efficiency of the gas turbogenerators by finding alloys which will be more durable at higher temperatures is another.

The gas companies must find ways to meet demands which are expected to arise from some electric companies for long-time fuel contracts. Since both the electric and gas utilities are subject to regulation this situation will pose problems.

Some of the electric engineers say that gas turbine generation will not increase the amount of gas used for fuel where gas is the fuel already used in the steam plant. Of course the new type of engine, if adopted in coal burning plants, will increase the gas load. Some gasmen believe that overall a big new market will be created for natural gas if the gas turbogenerator principle is quite generally adopted.

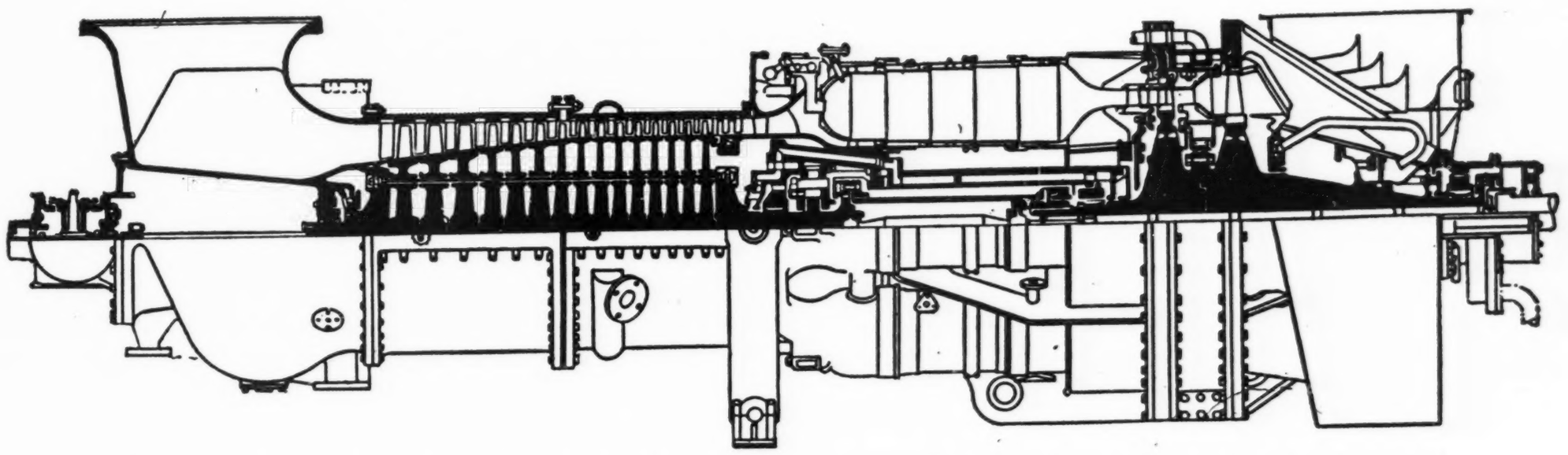
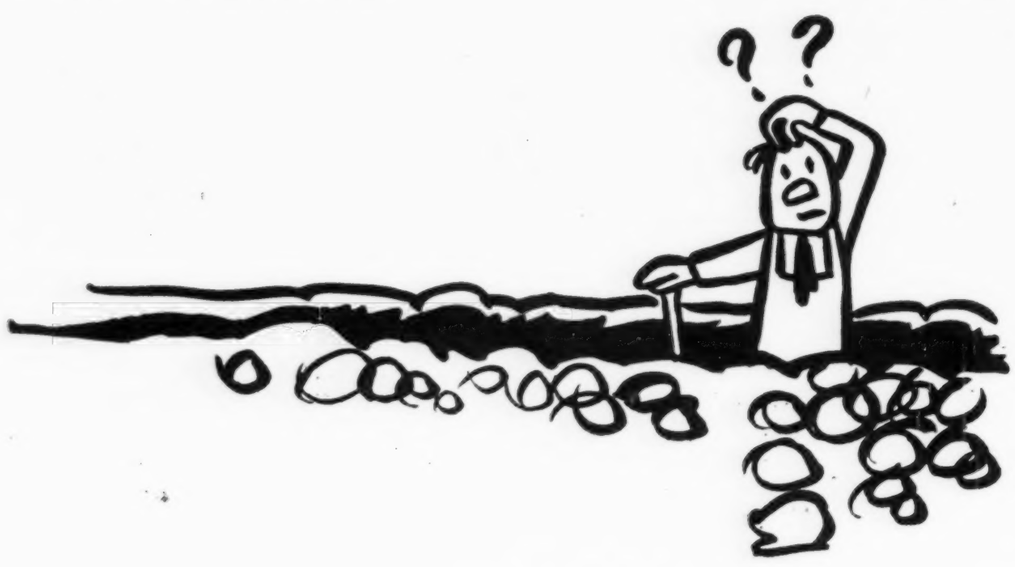


Diagram of the simple cycle turbine which will go into operation at Oklahoma Gas & Electric Co.'s Huey station.

How To Find Buried Lines With Pipe Locators



FINDING THE PIPE
Fig. 1. "On handle" method, for loca unknown pipe. When pipe is crossed, nal is heard in headset, meter regis

By J. L. CASSINGHAM

IT is easy to avoid unnecessary delay and expense which occur too frequently during ditching and pipe laying operations. All too often ditching machines sever gas pipes and water mains because their location is not accurately known. The use of a modern, efficient pipe locator can eliminate practically all such costly damage. One southern California gas company is so aware of this that it has nearly 500 in use today.

Exclusive

Basically, the Goldak pipe locator, described herein, works on two relatively simple principles. When it is necessary to explore for unknown pipes the instrument is operated with the handle as shown in *Fig. 1*. In this procedure, the locator is being operated as an induction balance. The transmitter, which is the unit mounted at the rear of the handle, energizes the ground to a depth of some 15 ft. Since the ground itself is a conductor, it will set up some radiation which will be picked up by the receiver and cause a signal in the headset. Obviously it is necessary to eliminate this signal from the ground. This is done by simply adjusting a control on the handle until a silence or "null" is achieved. The instrument is thus "balanced" with the ground. When a pipe is crossed this balance will be disturbed and a signal will result. This happens because a pipe is a much better conductor than the ground.

In the other application, used when a pipe has been located and it is necessary to trace it, the units are removed from the connecting handle. The transmitter is placed over the pipe in a position generally parallel to it. The operator then proceeds along the pipe swinging the receiver as shown in *Fig. 3*. Each time the antenna in the receiver passes over the pipe a sharp peak signal will be heard. By slowly increasing the power as the distance between the transmitter and receiver increases, the operator can trace a pipe up to 250 ft. The transmitter can then be brought up and the procedure repeated.

Mr. Cassingham is engineer for the Goldak Co., Glendale, Calif.

THE GOLDAK SIGNAL
Fig. 6. Solid curve shows sharp, full signal which reaches peak when pipe is crossed, determines general pipe location.

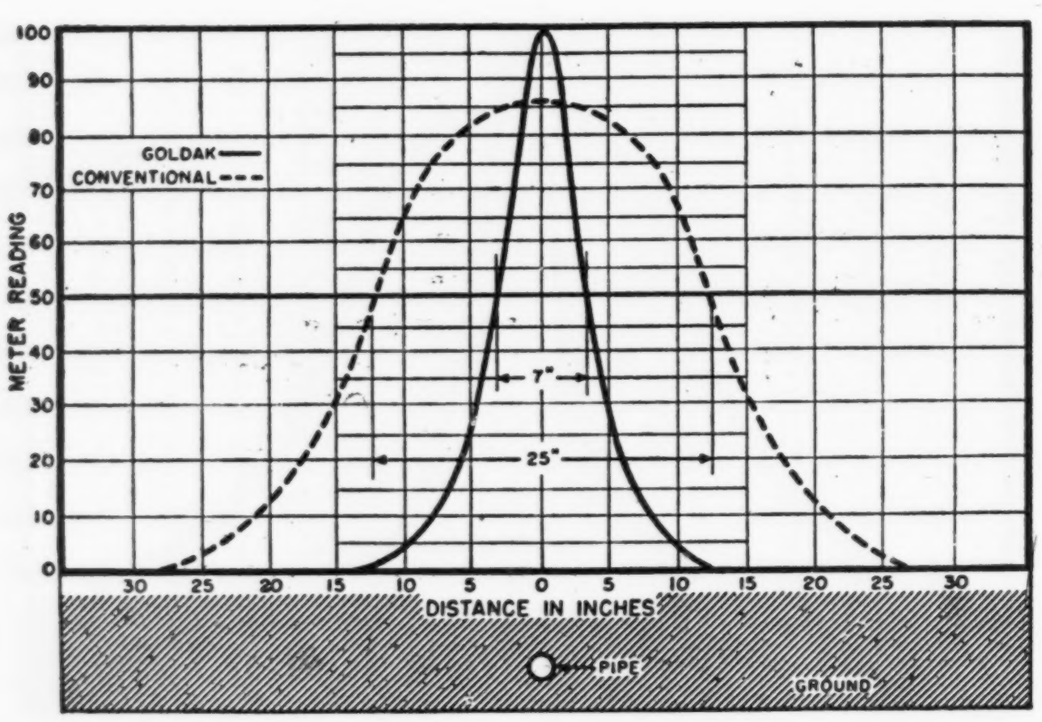
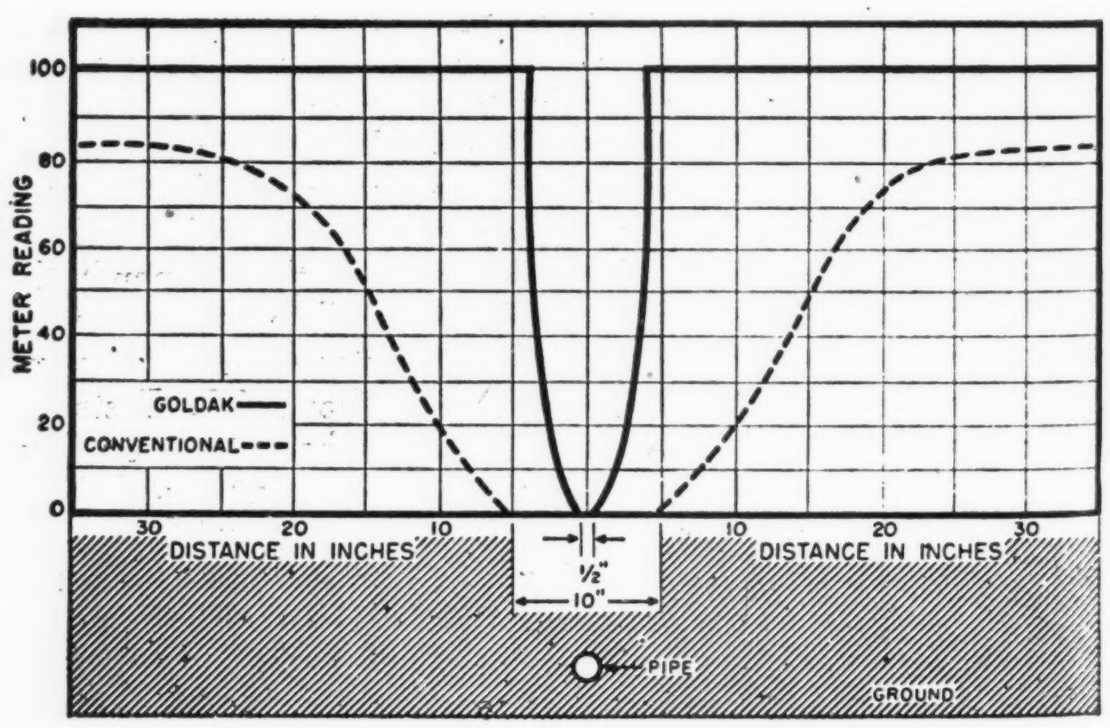


Fig. 7. For pinpointing pipe (see Figs. 8 & 9), signal hits a null as indicated on graph. Location is narrowed to a space less wide than the pipe itself, as graph illustrates.



2. For unusually deep pipes, or when y mineralized ground is encountered, built-in drop handle may be used to additional penetration into the ground.

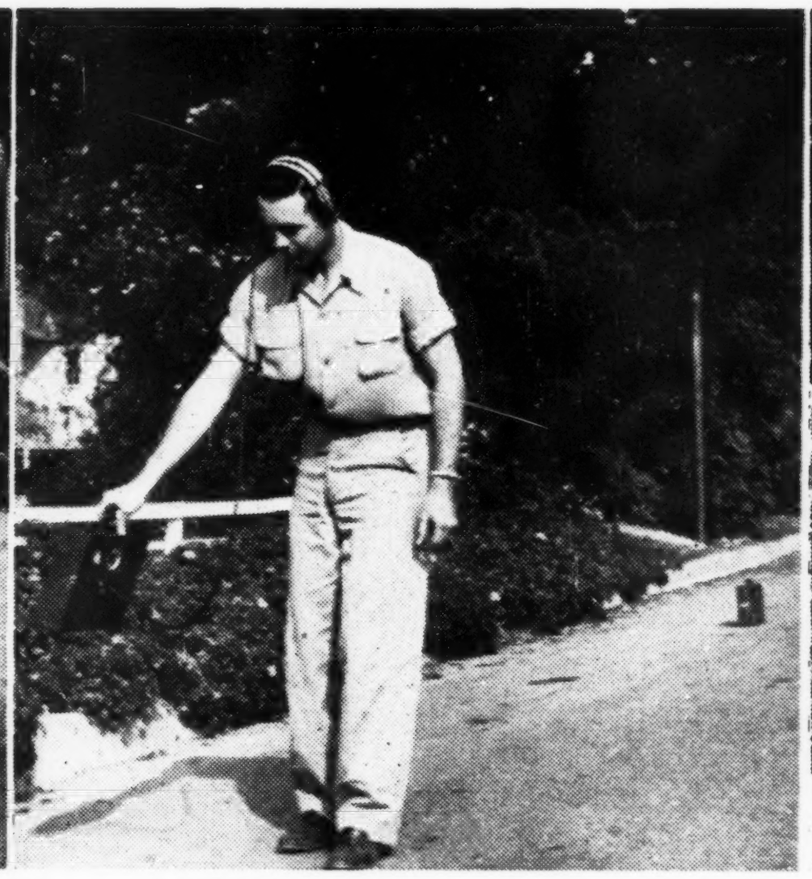


Fig. 3. For tracing, transmitter is placed over pipe in a position generally parallel to it. Operator swings pipe as he walks; over the pipe a sharp signal is heard.

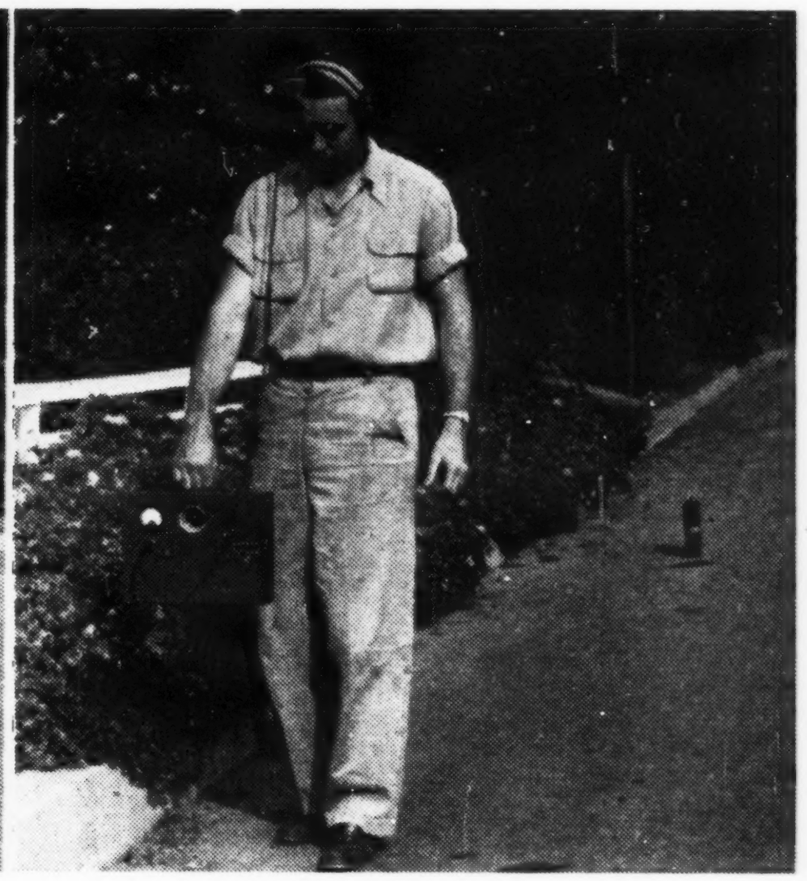
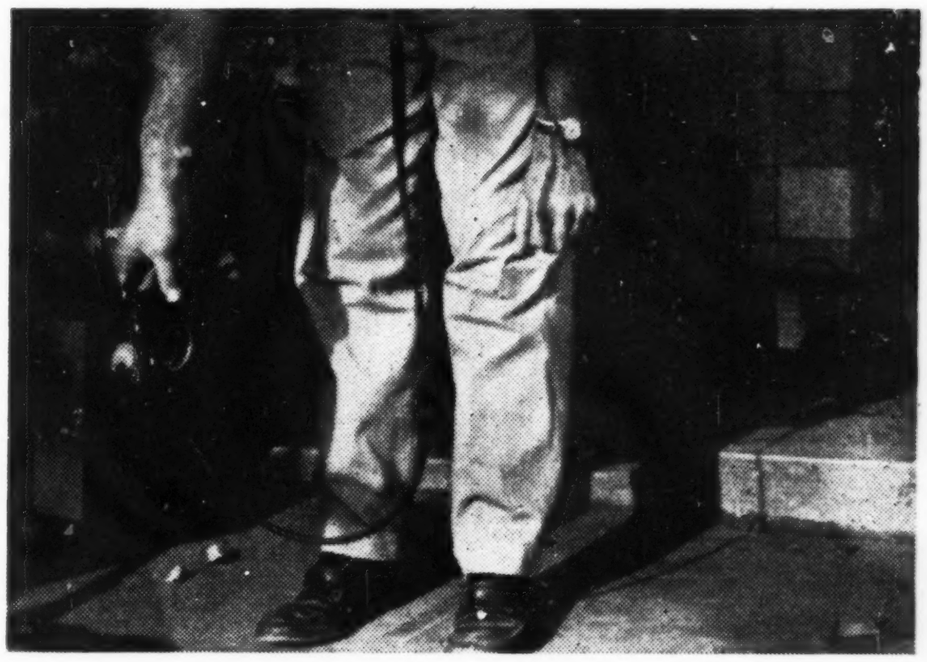


Fig. 4. To find stubs after main has been located, transmitter is placed over main and receiver is carried along at right angles. Crossing stub will cause signal.

To center a pipe accurately, the receiver is held over the pipe as shown in *Fig. 8* and is shifted back and forth. Here the conditions are the reverse of those prevailing in the tracing operation. Since the units are held in different positions with relation to one another, the loops in each unit are now in differing planes. Therefore the receiver, when it is directly over the pipe, with the pipe exactly bisecting it, will produce an abrupt null. This null is always narrower than the pipe itself. *(See Fig. 7.) Fig. 9* shows how the depth of a pipe may be determined.

In the event several pipes are running parallel to each other in close proximity, it may be necessary to make a direct connection to the particular pipe necessary to be traced. When this is done a switch is thrown on the transmitter so that only this one pipe will be energized. This procedure is illustrated in *Fig. 5*.

The Goldak Model 87, illustrated, has been designed for fast, simple, yet accurate operation. Weighing but 11 lb, it is completely portable and easily operated by untrained personnel.

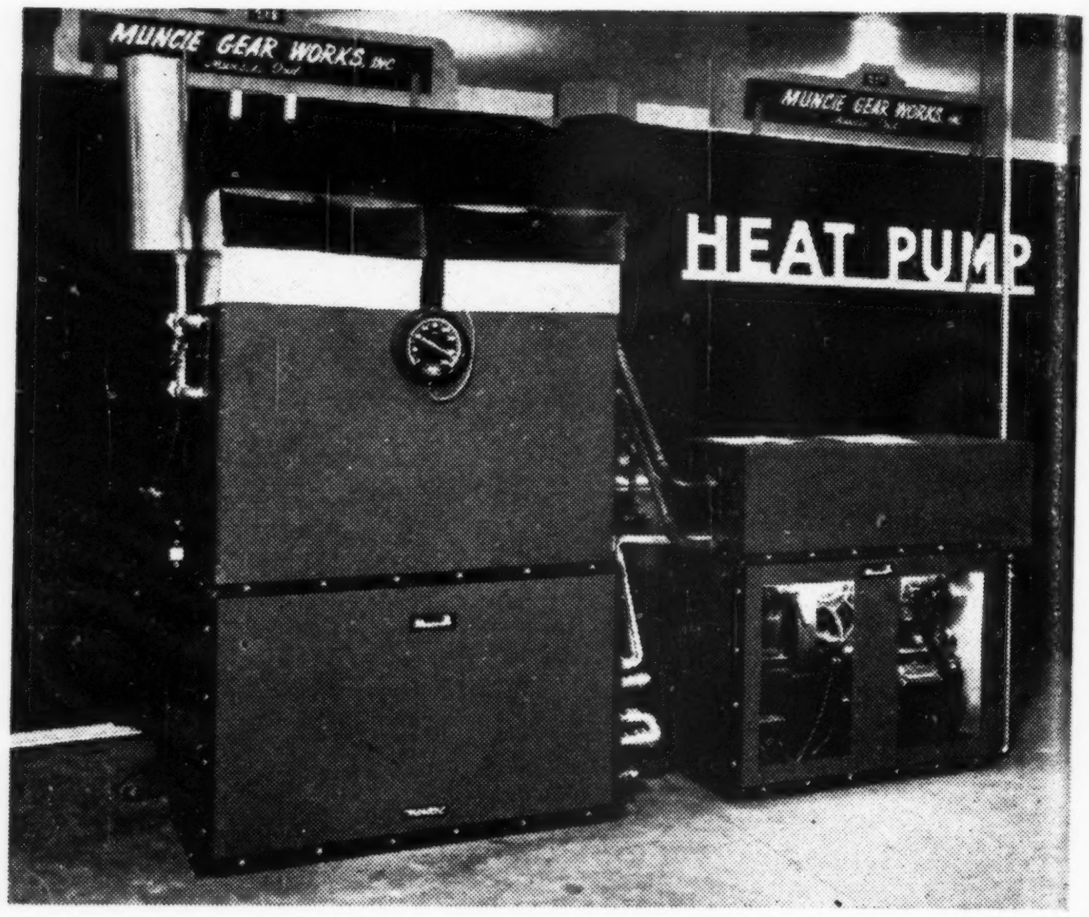


ENERGIZING A PIPE
Fig. 5. To energize one pipe among a group, a direct attachment is made between transmitter and pipe. Operator proceeds as is shown in Fig. 3.

PINPOINTING THE LOCATION
Fig. 8. Centering pipe. With loops of units in different planes, null is heard directly over center of pipe.

Fig. 9. To determine depth, receiver unit is held at 45° angle and moved slowly away from line of pipe. When unit has moved out distance equal to pipe depth, sharp null occurs.

Gas Powers A Heat Pump



THE Gas-Marvair, a new development of considerable interest to both the gas utility and the liquefied petroleum gas industries, was on display at the AGA convention in Atlantic City during the fall. It was in actual operation in Convention Hall, with propane as a fuel.

Exclusive

In order to supply the reader with more detailed information about its significance, *GAS* has obtained the story of the Gas-Marvair from the manufacturer, Muncie Gear Works Inc., of Muncie, Ind.

The Gas-Marvair is described as a gas-powered, automatic air conditioning plant in a compact unit, which can be installed in a basement, utility room or garage. In addition to use in homes, it can serve for stores, beauty parlors, cocktail lounges and similar commercial establishments. Basically, mechanics are those of the ordinary household refrigerator unit.

With the Gas-Marvair, gas provides the energy for driving the unit. Aside from this the unit is exactly the same as the electrically driven Marvair, now in operation all over the country. Neither gas nor electricity is used entirely as a fuel for the direct production of heat. One or the other is used to power the unit, which brings heat up from the earth.

The manufacturer states that the Gas-Marvair furnishes heating at a cost of less than 50% that of conventional gas heat. Since gas is a moderately priced form of basic energy, the Gas-Marvair is said to furnish cooling at a considerable saving in most areas. From the point of view of the gas utility, the Gas-Marvair, according to the manufacturer, affords a means of reducing peak requirements on heating and provides a summer load. It is said to cut the peaks and fill the valleys.

The Gas-Marvair, it is claimed, is adapted to producing comfortable temperatures the year around in homes, offices, or small commercial buildings. Heat or cool air, as needed, is produced and circulated through convenient forced air ducts. Changeover to heating or cooling is accomplished by means of controls furnished with the unit. The Gas-Marvair filters the air to reduce dust and dirt and provides moisture control.

There are four basic components of the Marvair: the energy source: the refrigeration system, or means whereby the earth's heat is delivered to the air distribution system in the winter, or taken from the air distribution system and delivered to the earth system in the summer; the heat source, which takes heat from the earth in winter and delivers heat to the earth in summer; and the air distribution system, which delivers the heat or cool air wherever it is required.

The Gas-Marvair uses a quiet gas engine as the source of mechanical energy driving its compressor. By combining heat from the earth with

TABLE 1. COSTS OF HEATING WITH GAS-MARVAIR COMPARED WITH OTHER TYPES

	Unit Cost	Furnace Efficiency	Net cost per therm
Coal (12,000 Btu/lb)	$15.00 per ton	50%	$0.125
Oil (150,000 Btu/gal)	.15 per gal	70%	0.143
Gas (1000 Btu/cu ft)	1.00 per Mcf	70%	0.143
*Gas-Marvair (1000 Btu/cu ft)	1.00 per Mcf	.....	.06

*Laboratory tested.

TABLE 2. CAPACITIES OF GAS-MARVAIR

Heating Cycle		
1. Btu delivery (total)	160,000	200,000
2. Btu from water	77,000	96.250
3. Btu input (natural gas)	90,400	116,000
4. Engine speed	1300 rpm	1500 rpm
5. Compressor speed	700 rpm	808 rpm
6. Head pressure	165 lb	175 lb
7. Suction pressure	25 lb	25 lb
8. Plenum temperature	120°F	130°F
9. Return air temp.	70°F	70°F
10. Fan capacity	3150 cfm	3150 cfm
11. Water flow	1000 gph	1000 gph
12. Water inlet temp	50°F	50°F

Cooling Cycle — Capacity 7½ to 10 ton.

AT LEFT, the Gas-Marvair heat pump as it appeared in operation at the GAMA exhibit in Atlantic City Oct. 4-8, 1948.

heat recovered from the exhaust gases and water jackets, performance is obtained using a moderately priced form of basic energy. By the application of certain acoustical techniques, the noise level of the engine is reduced below that of the ordinary circulating fan or oil burner.

The device can be adapted to any type of heat source system. When sufficient water supply is available, direct use of water furnishes the simplest and most economical system. When sufficient water is not available, the many types of ground systems should be investigated to determine the one most economical and satisfactory. Developments in improved heat source systems and the variation in local conditions make it necessary to consider the best procedure for each locality.

The company publishes a U. S. Geological Survey map showing ground temperatures throughout the United States for approximate water temperatures at 30 to 60 ft. For wells of greater depth, one degree is added for every 64 ft. For shallower depths, earth temperatures vary seasonally and reflect mean air temperatures.

In the winter the Gas-Marvair takes heat from the earth and delivers it to the hot air system. In the summer it takes heat from the air being cooled and dehumidified and returns it to the earth. Any type of cooling system must provide means of dissipating the heat taken from the air being cooled, and the Gas-Marvair uses this same system as a heat source when operating on the heating cycle.

The Marvair refrigeration circuit consists fundamentally of four elements, a compressor, an air radiator, an expansion valve and a water radiator.

On the heating cycle, the compressor pulls low pressure gas from the water radiator, raises the pressure and temperature of the gas, and passes it on to the air radiator. Here the heat is given up to the air as it passes over the radiator. In giving up this heat, the refrigerant vapor is condensed to a liquid, and passes back to a receiver or storage tank. As heat is required, this high pressure liquid is passed through an expansion valve into the water radiator where it is vaporized. In so doing, it picks up new heat from the water and continues its path around the refrigerant circuit.

When cooling is required, the path of the refrigerant is reversed, and the hot refrigerant vapor is passed to the water radiator and the air radiator is used to vaporize the refrigerant gas.

The Marvair uses the conventional air duct system to transport the air to and from the space to be conditioned. A motor driven fan used in connection with the compressor unit provides a quiet means of transporting air to and from rooms. When the unit operates on the heating cycle, the air to be conditioned flows over the air radiator where its temperature is increased.

When the room temperature exceeds that necessary for comfort, the unit is converted to the cooling cycle. Then the air is cooled as it passes over the coils. At the same time, moisture is condensed out if the humidity is too high.

The Marvair is equipped with thermostatic year 'round control.

Comparative costs of heating using common basic energy sources, in delivered cost per therm (100,000 Btu), as quoted by the company are shown in *Table 1*.

Performance data are given in *Table 2* for the Gas-Marvair, using natural gas, manufactured gas and bottled gas. The capacities obtained by this unit on long test runs are listed there.

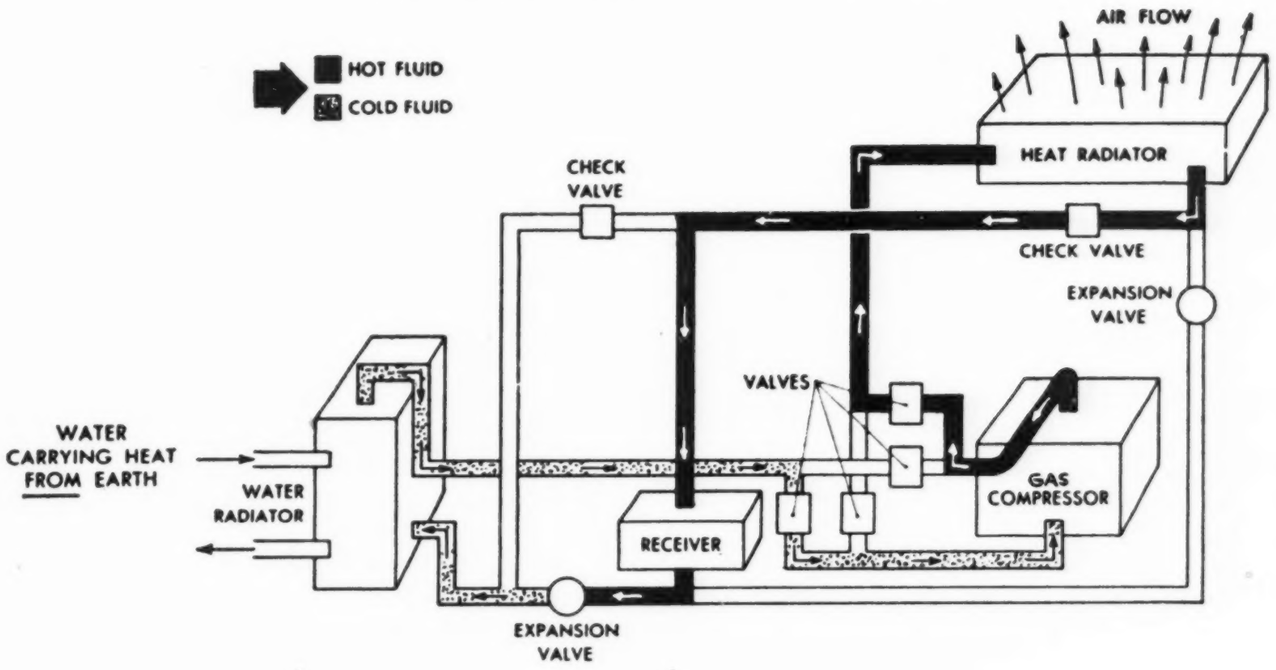
GROWING CONTROVERSY has centered about the so-called "heat pump" as in recent months its fame has begun to spread. Many skeptics believe it still impractical, others predict its installation cost will be prohibitive. GAS does not wish to take issue with these viewpoints, nor does it necessarily subscribe to them. It does believe, however, that its editorial pages would be incomplete if it ignored an application of gas that is new (and revolutionary, despite the fact that the principles of its operation are as old as the mechanical refrigerator).

This expository article will serve as an introduction to the first announced gas-fired heat pump, the Marvair. Herein is presented only the manufacturer's story of his product's performance. As the device is still in the experimental stage, the author made no attempt to obtain actual operating data.

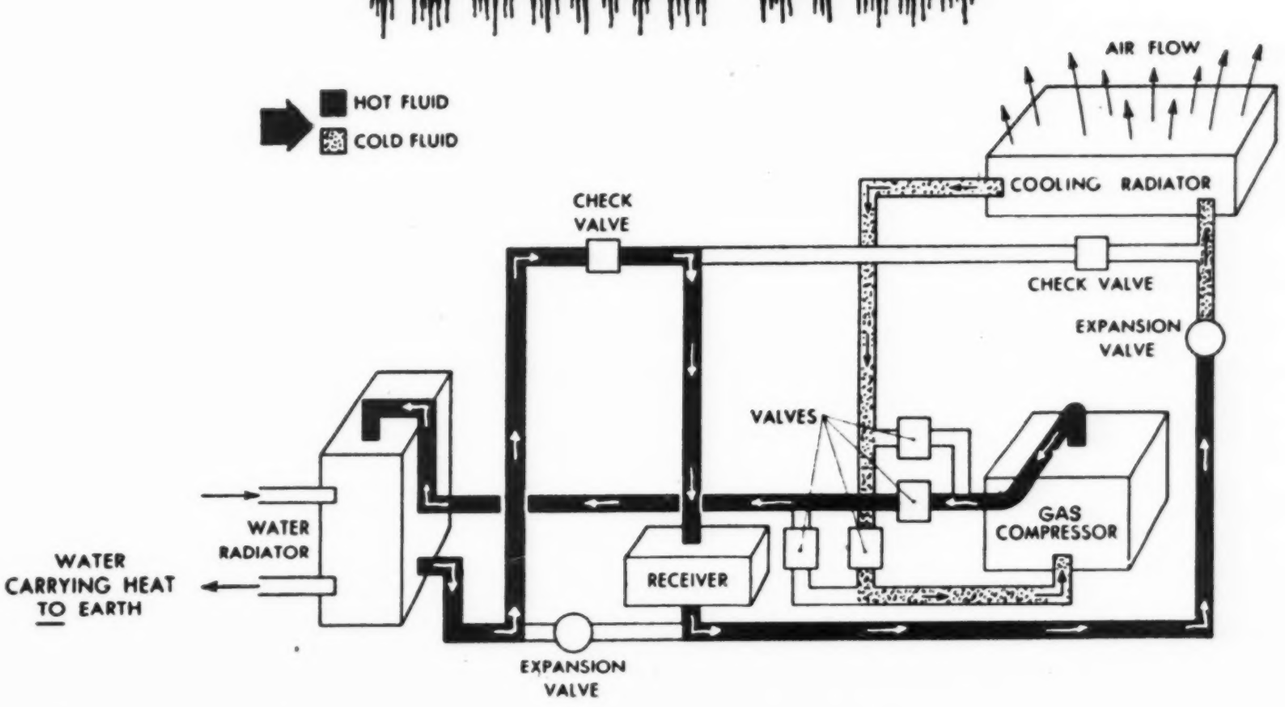
The editors believe that, at this time, the real significance of the gas-fired heat pump is that it may serve as the gas industry's answer to the electrical industry. This type of air conditioning system in the past has, to the best of our knowledge, been considered the protege of electricity. It is evident from this story, however, that gas in this application can do everything electricity can do. Whether either one will make serious inroads on the types of air conditioning now considered "conventional" remains to be seen.

GAS invites reader comment.

HEATING CYCLE



COOLING CYCLE



Piedmont Industrial Boom Forecast If Natural Gas Line Approved

By EDWARD TITUS

THE REMAINING AREAS where natural gas is not presently being served are gradually being compressed into smaller and smaller pockets. Some are still virgin territory, but plans are in the works for all of them. Only time and government approval stand in the way of complete natural gas service.

One of the newest targets for pipeline planners is "Piedmont." This project, currently before the FPC for approval, is not without opposition. At least 26 intervenors had already filed early in December, including 20 of the municipalities scheduled to receive the gas and the usual railroad and coal interests and labor unions.

A project that may provide a welcome natural gas transfusion for various medium sized and small companies using manufactured gas, and which would open up an entirely new area to the industrial and domestic benefits of this ideal fuel, is that of the Piedmont Natural Gas Corp. This company now has its application before the Federal Power Commission. The project is reviewed here as being of potentially vital importance to a large section of the Southeast.

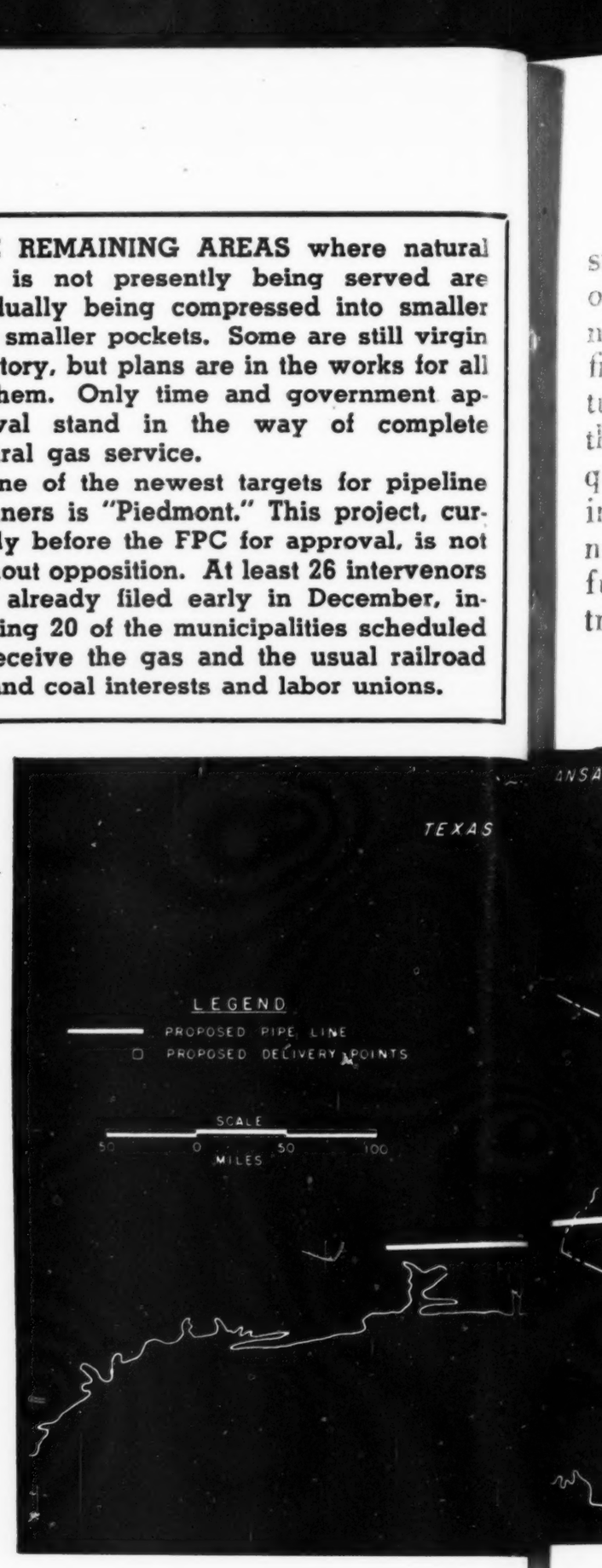
Exclusive

It is of interest also to note that the authorized pipeline of Trans-Continental Gas Pipe Line Corp. is planned to go through or close to much of this territory on its way to the big cities of the Northeast. This line is aimed primarily to supply this Northeastern territory, the big companies in New York, Brooklyn, New Jersey, Philadelphia and Long Island having contracted for supplies. Recently Trans-Continental was granted permission to substitute 30-in. pipe for 1210 miles of 26-in. pipe, and this has led to speculation as to possible uses for the increased capacity.

Whether or not the Piedmont company or some other is the final selection to serve the Piedmont area, its proposal was the first concrete one for its important territory.

The area to be served includes what is generally known as the Piedmont region or plateau. It is one of the most densely populated and highly industrialized areas of the South. It is said to contain a majority of the textile industry of the United States. It includes an important part of the furniture industry, a sizeable portion of the tobacco manufacturing industry, as well as many allied and non-allied industries. It is asserted to be the fastest developing area of the Southeast, and every year sees many new and diversified industries established.

A map submitted by the company shows 34 principal communities in the region now served by manufactured gas. The application states these communities represent only a small portion of those that could economically be served with natural gas, and their total population "is much less than half the total population of all such communities." Even where manufactured gas is available, its per-customer consumption is low, due to limited available supply. Limitations on the supply of fuel oil and liquefied petroleum gas have made it difficult for the manufactured gas utilities to increase their capacities to meet increasing demand. Last winter, it became necessary to restrict use of gas for space heating in many of the cities.



Specifications

Piedmont seeks certificate authority to construct and operate a natural gas pipeline approximately 990 miles in length, originating in the upper Gulf coast gas fields of Texas and southwest Louisiana and extending through Mississippi, Alabama, Georgia, South Carolina, North Carolina and terminating in the vicinity of Danville, Va.

The line would be 20 in. in diameter for its entire length and be designed to operate at a maximum working pressure of 900 psi with a compression ratio of 1.4. For this operating pressure a wall thickness of 0.25 in. is required, using steel of 52,000 psi yield point. There would be 12 compressor stations having a total of 87,000 hp. The capacity of the line would be 215 MMcf per day. Estimated cost of the pipeline with compressor stations, river crossings, metering stations and appurtenant facilities is $75,444,000.

The application states the company at the time of filing had closed no firm contracts for purchase of its gas supplies, but had been negotiating with owners of reserves totaling many times its requirements, and was assured that satisfactory contracts would be effected.

It was proposed to operate the lines in transmission of natural gas for resale to distributing companies in South Carolina, North Carolina and Virginia. It was proposed to finance construction of the line through issuance of bonds, preferred stock, bank loans and additional common stock. It was stated in the application that discussions with underwriters had assured applicant that satisfactory financial arrangements could be made.

Sponsors of the project have been actively engaged in its development for many months. Negotiations for sale of city gate gas were in process at the time of filing of the application. Tentative agreements had been reached for the sale of off-peak gas on an interruptible basis to assure operation of the line at a satisfactory load factor. The applicant company had investigated availability of pipe and other equipment, and while aware of shortages was confident it could acquire such materials on a competitive basis and within a normal delivery schedule.

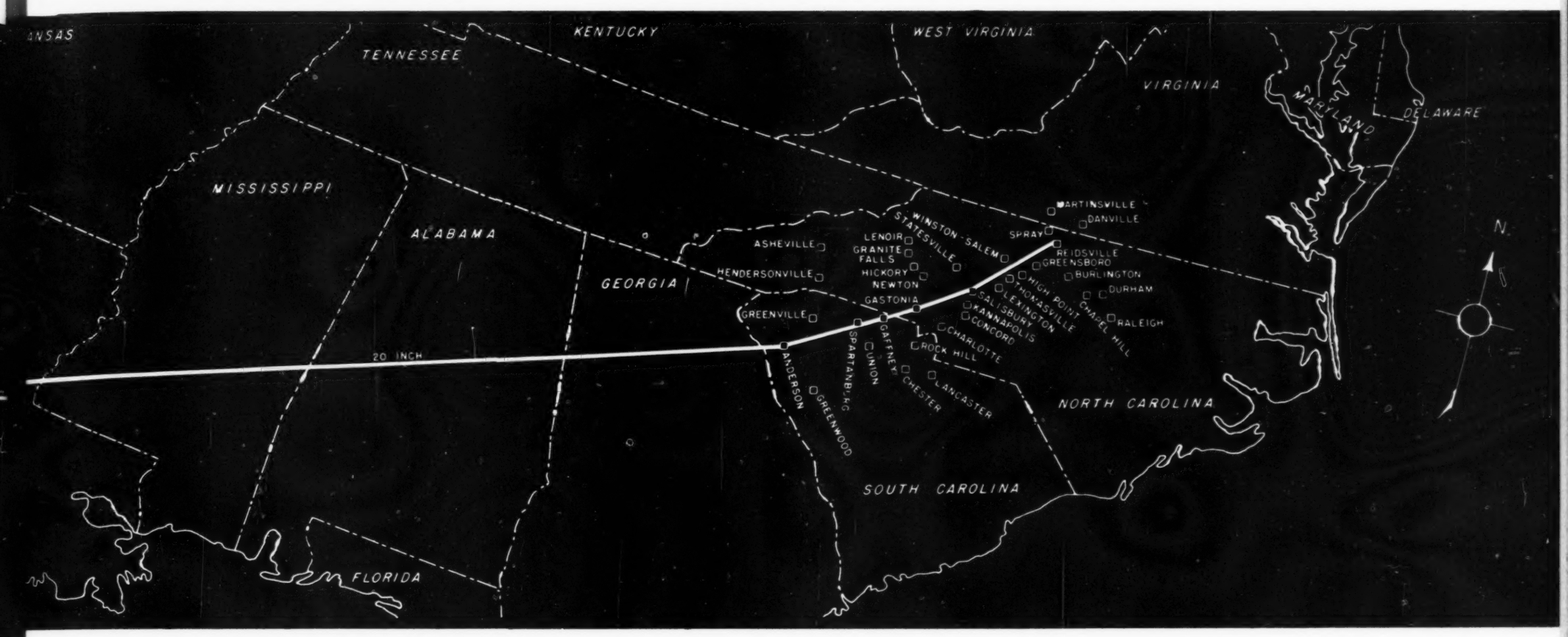
The size of the line to be built was determined after a study of the population of the area. Its capacity was set at a figure estimated to serve the potential domestic, commercial and firm industrial demand on the peak day. It was estimated that, in addition to the approximately 60,000 customers now receiving manufactured gas, there could be connected at least 200,000 additional domestic and commercial customers.

The applicant concluded from its studies that glass, brick, ceramic and other diversified manufacturers, the numerous textile dyeing, bleaching and finishing plants, the rayon manufacturing plants and chemical plants in the area would consume considerable quantities of natural gas for processing. And it is foreseen that coming of natural gas will result in large scale further development of such industries.

It is pointed out that the principal pletely surrounded.

Stone and Webster Service Corp. was engaged to make an office study of all the statistics of the area to determine a minimum market for both domestic and industrial gas. The figures established in this study were used in the application.

Early in the investigation it was found that every pipeline coming out of the natural gas country already was overloaded. The new group made contacts, however, which satisfied them of the gas companies is both willing and able to make service available wherever it is economically feasible to do so throughout its territory. Piedmont proposes, however, to make direct sales to large industrial users. Where such users are within the area of gas company distribution systems, delivery may be made by the gas company through special arrangements which the company and Piedmont will work out together. Piedmont plans to serve directly the industries outside the



industries of the area—textiles, furniture and tobacco—were all considered essential to the war effort in World War II. In another war, availability of natural gas would contribute to their uninterrupted operation and lessen the burden on overtaxed transportation facilities.

Genesis of The Plan

The Piedmont plan had its genesis with a group of people interested in the progress of this region, including W. P. Conyers Jr., president of the company.

They discovered it was the only major section of the South for which an application had not already been filed with the FPC. It was learned that two companies were seeking to serve an area consisting of all the Southeastern ports from Jacksonville, Fla., to Georgetown, S.C., and coming inland as far as Augusta, Ga., and Columbia, S.C. Atlanta and the central Georgia area are already served. Another application was on file for which a certificate later was granted, to serve the Chattanooga and Knoxville areas. A third was pending to serve Roanoke, Petersburg, Richmond and Norfolk. In other words, the Piedmont was com-

that they could get gas right from the gas fields, and therefore discarded the idea of buying gas from any other pipeline in favor of building their own.

During the late fall, they were engaged in a detailed market survey. The area is about 300 miles long and of about the same width. No part of it has ever had natural gas, and it has been only incompletely served with manufactured gas.

The aim is to take a careful measurement of the area, intelligently appraise its future growth and then lay out a pipeline system that will be tailor-made to fit it. Every effort will be made to avoid shortage difficulties and provide a service that will be adequate and satisfactory.

After the completion of the market survey it is proposed to firm up the gas purchase contracts, determine the exact location of the line and laterals, set up rate schedules, conclude final agreements with utilities, and make final preparations for the hearing before the FPC, on which the fate of the project will depend.

The Piedmont Natural Gas Corp. does not presently plan to distribute gas at retail anywhere. What they are seeking is adequate assurance that each towns and cities.

The field of the gas companies is that of retail delivery to homes and commercial establishments for space heating, cooking, water heating, etc. On the other hand, these companies will benefit from any industrial development that may come about through increased population and prosperity of the communities.

It is pointed out that to meet the public demand for natural gas service each company is likely to be faced with a major expansion program, and that this program constitutes both a challenge and an opportunity.

Towns to Be Served

In the map submitted with its application, Piedmont shows the following principal communities in the proposed service area, now served manufactured gas:

Virginia—Martinsville and Danville.

North Carolina—Spray, Winston-Salem, Statesville, Lenoir, Granite Falls, Hickory, Newton, Asheville, Hendersonville, Gastonia, Salisbury, Reidsville, Greensboro, High Point, Thomasville, Lexington, Kannapolis, Concord, Charlotte, Burlington, Durham, Chapel Hill and Raleigh.

South Carolina — Greenville, Gaffney, Spartanburg, Anderson, Rock Hill, Union, Greenwood, Lancaster and Chester.

Construction of New York Line To Begin in May

The Trans-Continental Gas Pipe Line Corp. was granted on May 29, 1948, a certificate of convenience and necessity by the Federal Power Commission for the construction and operation of an 1839-mile natural gas pipeline system for the purpose of transporting natural gas from the lower Rio Grande valley to New Yo-k City. The project is estimated to cost approximately $200 million.

A comprehensive article was carried exclusively in GAS at that time (July, pp. 33-36), outlining details of the construction program and revealing Northeastern utilities' plans for putting natural gas into their mains. Developments which have evolved since that time are repo-ted herein.

THE largest single contract ever let in the history of the gas industry has been awarded to Fish Engineering Corp. of Houston, which will design, engineer, and build the $200 million, 1839-mile Texas-New York pipeline for Transcontinental Gas Pipe Line Corp., Houston. Fish, which has been linked as consulting engineers with Trans-Continental since the line was first proposed, reports that work has already started on aerially surveying the route of the line, ground surveying of difficult terrain, and detailing the completed design work, and that field construction is due to start in May. Pipe deliveries will begin this month, and if everything proceeds on schedule the line should be in operation late in 1950—in time for that winter's peak load season.

A quick glance at the strip map will show the route of the line, which terminates at 132nd Street, New York City.

Alterations

Several important changes have occurred since the original plan was approved by the Federal Power Commission. Thirty-inch pipe has been substituted for 26-in. line for a distance of 1210 miles. While initial capacity will remain at 340 MMcf per day, ultimate input will total a half million. Ten compressor stations (see map) with an aggregate of 72.000 hp will initially be installed, with an additional nine stations and 148 000 hp in the works to bring the line up to ultimate capacity. With labor and material costs still rising, the original $150 to $180 million cost estimate has been upped to the $200 million mark.

The Kaiser Co. has contracted to furnish 500,000 tons of steel plate over a period of approximately 24 months from its Fontana, Calif. mill, at a minimum rate of 15,000 tons and a maximum rate of 25,000 tons per month. Consolidated Western Steel Corp. has contracted for the fabrication of the 30-in. and 26-in. main line pipe at its Maywood plant located near Los Angeles. The 20-in. main line pipe, 6-in. to 16-in. lateral line pipe, river crossing pipe and miscellaneous small line pipe will be fabricated by the A. O. Smith Corp., Milwaukee.

Reserves

Between the Rio Grande valley and the Mississippi river, and even beyond this point into Louisiana and Mississippi, the line will bisect the largest producing natural gas area in the United States. The estimated natural gas reserves in this area are approximately 90 trillion cu ft. Contracts for the supply of the entire requirements of the line have been signed with producers in this area, along with the dedication of adequate reserves for a 20-year period. Trans-Continental will take gas from the following fields: Conoco-Driscoll, La Gloria, West Gueydan, Starr County, Odom, Lube and Petronilla, Lacey, Quinto Creek, Bee and Live Oak Counties, North Markum and North Bay City, Egan, West Bernard, Fresh Water Bayou, and surrounding areas in Texas and Louisiana. The total gas reserves under contract approximates 4 trillion cu ft. Adequate gas reserves are available for the ultimate capacity of the line.

Much of the gas supply to the pipeline system will be flare gas.

Sales Contracts

Contracts for the sale of gas have been entered into with companies indicated on the map.

Arrangements for financing of the entire project have been completed. Common stock has been placed by private subscription and no public offering will be made. Long term first mortgage bonds, which have been completely subscribed, will provide for 75% of the required funds.

The Trans-Continental Gas Pipe Line Corp. was originally organized for the purpose of purchasing the government-owned Inch lines. At the time of bidding on the Inch lines an application was filed before the Federal Power Commission for a certificate to construct and operate a natural gas pipeline system over the route as now planned. Being unsuccessful in purchasing the Inch lines, the company immediately went forward with the application to the FPC, for the present pipeline system. Hearings before the Federal Power Commission were begun in October, 1947 and ended in May, 1948.

HYDROCARBON GAS USED INTERCHANGEABILITY

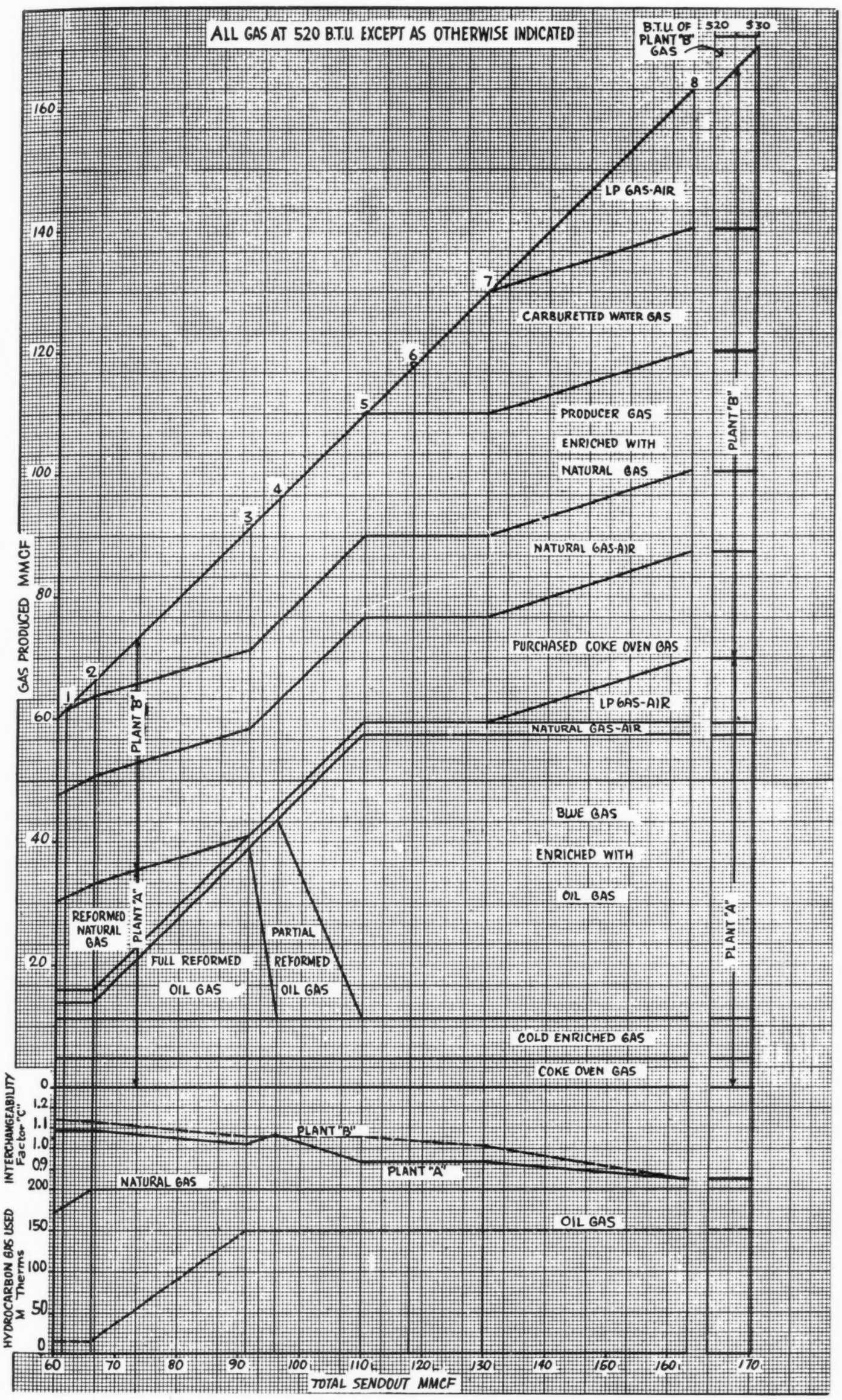


Fig. 1. Gas produced for varying gas sendouts showing interchangeability factor for gas sent out from each plant and therms of hydrocarbon gases used.

Economical Peak Load Production

How mixing of gases can be controlled to stretch skimpy gas making supplies

By E. G. BOYER
Manager, Gas Department
Philadelphia Electric Co.

A problem that becomes increasingly more complicated as peak loads increase, and whose complexity will be multiplied in the case of those companies using natural gas, is that of determining the most economical type of operation from a given supply of raw materials of various costs, as the sendout varies from day to day.

Oil-Gas Stretched

This problem is one that Philadelphia Electric Co. has been confronted with for a number of years in connection with its use of refinery oil gas, the supply of which has not always been adequate to meet maximum daily demands. Accordingly, the company has developed methods of reducing the amount used per Mcf of gas manufactured in order to "stretch" a limited oil-gas supply. In addition, spare equipment is put on the line to manufacture water gas, and, in recent years, LP-Gas equipment has been started up after practically all other facilities have been loaded to capacity.

Fig. 1 is a diagram of a type developed by us to show the kinds and volumes of gas to be manufactured for various sendouts. The diagram does not represent any actual or proposed operations of Philadelphia Electric Co. although it is, to some extent, based upon gases produced by us. It shows the types of gas produced at each of two plants by a hypothetical company, over a range of sendouts such as might be experienced from early fall to the following spring. The variation in the AGA interchangeability factor for the gas sent out from each of the two plants, as compared with the adjustment gas for which all customers' burners in the entire territory are assumed to be adjusted, is plotted against total daily sendout. The therms of hydrocarbon gases used are also plotted in the same way.

Assumptions

It is assumed that a maximum supply of 20 MMcf (or 200,000 therms) of natural gas is available per day; and that a daily supply of 10 MMcf (or 150,000 therms) of refinery oil gas is available. It is assumed that natural gas is the cheapest fuel, with oil gas being next. On this figure the abscissae represent total sendout, which is shown plotted across the bottom of the figure starting with 60 MMcf and going to slightly over 170 MMcf. Op-

eration below the 60-MMcf sendout level is omitted to conserve space and because it would introduce nothing not already demonstrated on the figure.

Near the bottom of the figure, the ordinates represent quantities of natural gas or oil gas used per day, and with the availability of the quantities previously mentioned, it will be observed that full utilization of these hydrocarbon gases is reached with relatively low sendout levels.

Factor "C"

The next higher section of the figure shows as its ordinates the value of the AGA interchangeability factor "C," as computed by taking the gas manufactured at each plant as test gas and comparing it with the adjustment gas for which it is assumed that appliances throughout the territory are set. It will be seen that this value fluctuates as the production of various types of gas is begun or changed to meet the total sendout requirements, and that at the right of the figure, the factor reaches the minimum recommended level of 0.85 just before the break in the chart at the vertical line numbered "8." As sendout increases above this level, it becomes necessary to raise the Btu of the gas sent out from Plant B in order to maintain interchangeability, and the heating value of that gas is indicated by a very short horizontal scale at the upper right of the figure.

The remaining and greater part of the diagram shows the quantities of various types of gases manufactured at Plants A and B. At the left. with a sendout slightly in excess of 60 MMcf (indicated by the vertical line marked "1" at the top of the figure), Plant A sends out coke oven gas, cold enriched gas, reformed oil gas, natural gas-air mixture, and reformed natural gas. The volumes of coke oven and cold enriched gas remain constant across the entire diagram despite changes in sendout, since coke oven operation is continued uniformly throughout the year and since the volume of cold enriched gas bears a fixed relation to that of coke oven gas.

Plant B Sendout

For this sendout, Plant B supplies a mixture of purchased coke oven gas and natural gas-air. The volume of natural gas-air is the amount necessary to make that plant's sendout interchangeable with the adjustment gas. Reference to the lower part of the figure will show that a sufficient amount of the higher gravity natural gas-air mixture has been added to reduce the factor for the Plant B gas to approximately 1.14, which lies just within the assumed range of interchangeability.

Since it appears from the lower portion of the figure that only 180,000 therms of natural gas are used to meet the sendout just considered, it is obvious that any increase in sendout will first be met with gases manufactured from the remaining natural gas. If we refer now to the sendout designated by vertical line "2," we will see that an increased quantity of reformed natural gas is produced at Plant A, while the production of producer gas enriched with natural gas is begun at Plant B, with the result that the full available supply of 200,000 therms of natural gas is used and the interchangeability of the gases is maintained.

We can consider next a total sendout slightly in excess of 90 MMcf and indicated by the vertical line marked "3." At Plant A, the production of full reformed oil gas has been greatly increased, with the result that the total supply of 150.000 therms of oil gas is used up. At the same time, the manufacture of reformed natural gas is discontinued, with the sets now being used to reform oil gas. The natural gas thus released at Plant A is then used to enrich additional producer gas made at Plant B.

Curtailment

As the total sendout increases to the level indicated by vertical line "4" (slightly over 95 MMcf per day), the production of "full" reformed oil gas at Plant A is gradually curtailed and finally discontinued entirely, while the manufacture of "partial" reformed oil gas is begun and expanded to provide for the additional sendout and to replace the discontinued "full" reformed oil gas.

The significance of this change is this: partial reformed oil gas utilizes only 4.1 therms of oil gas per Mcf, as compared to 4.8 therms required per Mcf of full reformed oil gas. The reduction is effected by reducing or eliminating the oil gas admitted to the set during the up-run, and the therms of oil gas so eliminated are replaced by additional generator fuel. Under certain conditions of fuel prices (such as are assumed here), it is more economic to "stretch" the oil gas in this way by partially replacing it with generator fuel, thus increasing production from a given supply, than to continue "full" reforming and make up the difference as carburetted water gas.

Line "5"

Vertical line "5" indicates a total sendout of approximately 110 MMcf per day, and for this sendout the supply of oil gas is "stretched" still further by first reducing and then eliminating the production of partial reformed oil gas and replacing it with blue gas enriched with oil gas. This change further reduces the therms of oil gas used per Mcf from 4.1 to 2.88, permitting an increase of more than 40% in gas production from the same supply of oil gas.

Again, the reduction in oil gas is offset through the use of more generator fuel, and in this operation the reforming of oil gas in the fire is eliminated completely, all the oil gas required in the process being utilized to cold enrich the blue gas. The resulting change in the burning characteristics of Plant A gas is reflected in the interchangeability factor, which has fallen from 1.07 to approximately 0.93. Again no change has been made in the gas produced at Plant B, but we have now reduced to a minimum the oil gas consumption per Mcf and further increase in sendout must be met through the use of more expensive fuels.

Stretching Natural Gas

At this point, I should explain that while I have described a method of "stretching" a limited supply of oil gas, a supply of natural gas could be handled in the same way. We have not yet determined, however, the therms of natural gas used per Mcf for various types of operation and I have, therefore, given data on oil gas instead, to demonstrate the principles involved.

The next vertical line which we need consider is "7" (since "6" is an intermediate step which may be neglected) which represents a total sendout of approximately 130 MMcf per day. In this case, Plant A operations

ON THESE PAGES are presented condensations of five important papers as abstracted by the staff of GAS. Three are from the convention of the American Gas Assn., held in Atlantic City last October; one is from the Midwest Industrial Gas Council, held in Chicago Oct. 15; the other is from the American Petroleum Institute's 28th annual meeting, held in Chicago in November.

Economical Peak Load Production
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Packaged Steam Generators
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Midwest Industrial Gas Council

The Dayton-Faber Process
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Petroleum Availability Will Rise
By the Subcommittee on Long-Term Availability—API Meeting 55

remain unchanged, while the total increase in sendout is met by manufacturing carburetted water gas at Plant B. The effect of this gas is reflected in the interchangeability factor for Plant B gas, which declines to a value of approximately 1.01.

Vertical line "8" represents a sendout of about 163 MMcf per day, with the increase being met by the production of LP-Gas-air mixtures at both Plants A and B. The effect of this is shown by the decrease in interchangeability factors for both plants to 0.85, the accepted minimum value.

Heating Value Raised

It is assumed that any further increase in sendout must be supplied by additional LP-Gas-air, which means that the heating value of the gas must be raised to maintain interchangeability. This is indicated by discontinuing and then resuming the chart to the right of line "8," with the daily sendout increased to a maximum of slightly more than 170 MMcf. Plant A operation is unchanged, and its gas remains at 520 Btu. At Plant B, however, additional LP-Gas-air is produced and the heating value of the sendout from this plant is gradually increased to a maximum of 530 Btu to maintain an interchangeability factor of 0.85. The "C" factors for both plants are identical, as shown by the superimposed solid and dashed lines in this part of the figure.

I might say parenthetically that this diagram is presented solely as an illustration and not to demonstrate the use of the AGA interchangeability factor "C." Certain of the gas mixtures shown might result in a ratio of hydrogen to inerts of less than one to one, but no account has been taken of this since it is intended only to indicate how the chart can be set up. Obviously, other interchangeability indicators and other information of a different nature could also be plotted. For example, during a transition period such as between lines 3 and 4 or 4 and 5, where a change is being made from one method of utilizing oil gas to another, it is very likely that the plant operators, instead of having a certain number of sets making, say, partial reformed oil gas and the remaining sets making cold-enriched blue gas, would have all (or at least some) of the sets operating with an oil gas rate per Mcf intermediate between the two.

For changes in sendout within this transition period, the oil gas consumption on such sets would be varied by changing its rate of flow or the percentage of the cycle during which it was admitted. Sets could be operated more easily in this way since they would use about the same amount of generator fuel, would have similar cycle, and would have about the same fire conditions. To assist in such operation, the figure could show the therms of oil gas available per Mcf to be produced on the sets during the transition periods. Generator fuel consumption per Mcf and in total tons could be indicated, since fuel and ash-handling capacity are frequently controlling factors. The specific gravity of the gas sent out by each plant could be shown, since this affects main capacity and the power required to pump the gas.

The use of such a chart in determining system production, once the daily sendout has been computed, is obvious. Its employment eliminates rule-of-thumb operation and assures the most economic use of the available fuels. A number of such charts could be provided to cover a range of fuel availability, and possibly changes in the relative costs of raw materials. For those gases whose production is dependent upon a fuel which is available at a uniform hourly rate (such as natural gas), a daily chart of the type shown in *Fig. 1* is sufficient, but for carburretted water gas or LP-Gas-air of which the entire daily requirements could be produced during a single shift to reduce labor costs, a similar chart showing operations for a single shift or for a single hour is also desirable. These charts, too, should indicate interchangeability and specific gravity, which might be affected by increasing the proportions of certain gases.

Another use of this chart is in the making of budgets or forecasts. For any given future month or year, the number of days' operation at sendouts falling between each pair of adjacent vertical lines on *Fig. 1* can be determined from the connected heating and non-heating load and from charts of degree day frequency or other temperature data. The total sendout during each such period of days can readily be estimated and the average daily sendout for each period computed.

Long-Term Forecasts

From the ordinate on *Fig. 1* corresponding to each such average daily sendout, the volumes and kinds of gases produced can be read. Production for each such average daily sendout multiplied by the number of days in the period for which the average has been taken gives the volumes of gases produced during the corresponding period of days. The sum of all such periods gives the production for the entire month or year being forecast. Since, between each adjacent pair of vertical lines, the volumes of gases vary with sendout according to a straightline relationship, the total production of each type of gas determined by the method just described is the same as if the production for each day of the period were calculated separately and the results totaled.

We have found charts of this type very helpful in preparing budgets and forecasts, and I believe that, particularly for those companies where the introduction of natural gas will give rise to problems such as Philadelphia Electric Co. has had in the past in utilizing its supply of refinery oil gas to best advantage, a chart such as this may contribute to the economic meeting of widely varying sendouts that result from increasing peak loads.

Modern Techniques in Purging

Full use of technical data and theory and thorough training are essential

By G. R. KING
Philadelphia Electric Co.

IN the gas industry today, the general meaning of "purging" is the act of replacing the atmosphere within a container by an inert substance in such a manner as to prevent the formation of flammable mixtures.

In modern purging, the inert substance used is important; the equipment and techniques employed are important. Yet more than these, purging in a modern manner depends almost entirely upon the attitude of the top men in a gas company toward the process. The modern attitude for modern purging includes:

1. Use of technical data and theory.
2. Use of the practical experience of others.
3. Use of written procedures for the work to be done.

4. Training and use of competent men.
5. Whole-hearted approval of purging as a required safety operation.

Technical Data and Theory

The gas industry is a chemical industry. The manufacture of its product is an exact science, following immutable natural laws concerning the breakdown of and union of various natural elemental solids, liquids, and gases. In this regard, we employ chemists to study these reactions and to carry on research to determine how each manufacturing process can be done better and more economically.

The AGA Gas Production Research committee, for example, has as its purpose the finding and proving of new and practical ways of uniting and changing these elements, according to natural laws, to produce usable, salable gases. We expend time and money for research of taking care of by-products, such as tar, ammonia, etc., and the undesirable gums, naphthalene, and others.

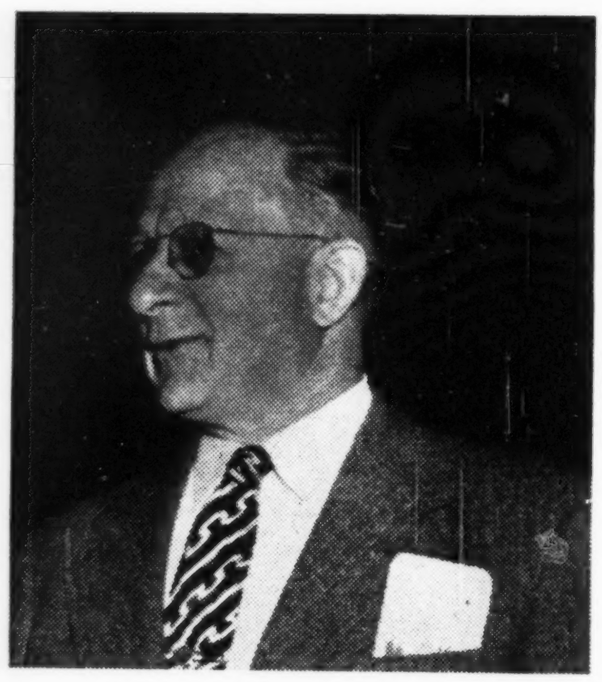
The theory concerning purging is exact, too, and follows immutable natural laws which can and should be considered in every job especially for large volume and large diameter containers. When the procedure is "just to purge" the process may be carried to extremes, and the time required and expense involved are much more than they could have been if theory had been applied.

Extent of Savings

H. E. Ferguson, of The Peoples Gas Light and Coke Co. of Chicago, said in a recent paper: "In 25 purgings of fuel gas from large holders in the past 7 or 8 years, satisfactory end points of about 8% live gas residue have been reached by use of 1.6 to 1.8 volumes of inert gas mixture. In purging air from holders, residues of less than 15% air were reached with 2.0 to 2.3 volumes of inerts. Such results are in marked contrast to those obtained 12 or 15 years ago when purging by inert gas producers was initiated in the Middle West. At that time 3.6 to 4.8 volumes of inerts were used in clearing large holders. The bases of this improvement would seem to be a better understanding of the mechanics of purging actions. . ."

That is, by applying known theory to the purging operation, the volume of inerts required may be decreased to less than half those needed for "just purging," with the resulting saving of time, bother, and expense. It certainly is worthwhile to be modern, and to apply the theory of purging.

AUTHORS



E. G. BOYER

G. R. KING

From time to time this theory has been printed in publications devoted to the gas industry so will not be included here. These articles include:

1. The determination and calculation of the explosive limits of fuel gas in air.
2. The preparation of "end-point diagrams" to determine what the safe "end-point" mixture should be within the container, beyond which it is unnecessary to continue to purge.
3. The mechanics of purging, which discuss the relative merits and methods of purging by dilution and mixing.
4. The theory and practice of using steam as a purging agent.

Experience of Others

For modern purging, the knowledge of theory is the first requirement; the second is knowledge of how that theory has been applied by others. Speaking generally, it is true that in many cases we can take a theory and work out a way of applying it. The results may be totally satisfactory. On the other hand, they may not be because, in trying something new, we do make mistakes and we learn and profit only by our trials and errors and experiences. Over a period of time our efforts usually will be successful and theory is made practical. This is research, pure and simple.

But it is very possible that someone, somewhere, at some time, had the same problem before we did, and solved it by similar research with reasonable success. Perhaps somewhere else someone solved the same problem in a different way—yet generally satisfactorily—and perhaps those persons were so pleased with what they did that they wrote about it to "tell the world," as it were. Here, for example, are two persons who had researched our very problem. Should we not profit by their experiences, and save ourselves the headaches of our own experiments?

And so it is in regard to purging. It may not seem too difficult, involved, or complicated to purge a piece of equipment applying our own ideas. We do get it purged, but can we really say that we have done it in a good, workmanlike manner, in the quickest time, yet with sufficient safety in *all* phases of the job, with minimum amount of inerts, with the fewest possible men used to the best advantage? If we cannot say "yes" we have not purged in a modern manner.

The literature of the gas industry contains numerous publications of purging experiences, and the way in which problems have been met and overcome. They make very profitable reading and contain much material for study.

Written Purging Procedures

The third step in modern purging practice is to apply the theory and sound practical experience to the job in hand. This requires planning and preparation, which should be summed up in a written "Sequence of Operations," or "Procedure" for the operation.

Some purging jobs are very complicated; some are very simple. Some require the manipulation of many valves; some, none. Some may include ridding the apparatus of volatile oils and sludge, etc.; others, of just gas or air. The possible combinations are innumerable.

However, whether the operation is complicated or elementary the fact remains that flammable gas and air are being handled and each job involves the possibility of creating a flammable mixture within the container. For this reason each job should be thought out and planned to determine the safest way of doing it; the best way to remember the plans is to write them

down with drawings or sketches.

The steps in the use of the written procedure are these:

Approval of the procedure by superiors. It is not sufficient that the procedure be prepared by a foreman, or even a superintendent. Due to the risks involved, the top operating men should review the procedure so they may know what equipment is involved, its effort upon operations, and how the work is to be accomplished. They should cite their opinions and suggestions; from these discussions the final procedure is evolved. The top men should show their approval by signing the final form of the written plans.

Discussion of the procedure with the personnel who will participate in the actual purging. This is very important. As a rule, the men "down the line" appreciate being taken into confidence concerning a job, being told the objective of the entire plan, and the reasons for the various steps. When men understand the inter-relation of various steps, they take more interest and do a much better job than if they are in the dark.

Too often supervisors keep the plans to themselves, and as the work progresses they say to the workmen merely, "Do this," and "Do that." And all of us have heard the men, at times, grumble among themselves with "What's he want this done for?" "Why doesn't he do so-and-so?" Such an attitude breeds carelessness and indifference and these, on a purging job, are hazards.

How much better the attitude of mind is by contrast, when a man can think to himself, "Now, what I'm doing here, affects what Charley's doing at the other end of the plant, and what Gus is doing up on the top of the holder. I'd better be careful." And the job gets done well, and everyone is happy knowing he had an important, though perhaps small, part in the complete job. Yes, it pays big dividends to acquaint the workmen with the details of the procedure.

Adherence to the written procedure —unless, of course, circumstances arise that absolutely require emergency deviations. Some field operators take the attitude that written directions are a bunch of nonsense, and are merely brainstorms of the brain-trust in the office. They assume the attitude that, "I can do this job without the written plan." Perhaps they can —and perhaps they cannot.

To eliminate this possibility, the work should be in charge of a competent, reliable man. It makes no difference what his title or position

may be—special laborer, foreman, superintendent, engineer, or manager. What matters is: does he understand purging, and can he be relied upon to do the job carefully, as planned and approved?

When the man is selected, he must be allowed to be the one and only boss of the purging. This may seem trite, but it is important. As boss, he will follow the procedure, and no step shall be undertaken without his approval. Even top men in the organization—superiors in position to the purging boss—should not be permitted to issue any orders without first discussing those orders with the purging supervisor.

As the purging progresses, notes should be made concerning that progress, together with any changes found to be necessary in the planned procedure. These notes serve for future review of purging practices, and as a source of experience in the planning of future purging operations. They can form the basis for instruction in purging, if it is thought advisable to have a "purging school" within your company. The written procedure should be a must in modern purging.

Use of Competent Men

Even though theory and practical experience are applied, and a written procedure prepared, they are not worth much unless trained and competent men are available to carry out the plans. Some of this subject was discussed in the preceding section, and covered discussing the planned procedure with the men, and having the entire job under the supervision of a competent and reliable man.

Competence in the job includes training, and training will include some of the theory of purging. In this respect, there are men who say that the man in the plant will not understand theory; in fact, he will not be interested in it. It has been my experience that this is not true for the large majority of the men in the plant.

First of all, due to the hazardous nature of purging, only the best men should be chosen to participate in the operations. The best include those who have shown themselves to be reliable, eager to do a good job, and apt to learn. These men, I am sure, will welcome any instruction that will help them with their work. So far as theory is concerned, the training can be made interesting. No deeply technical course should be given, but one that will cover the subject sufficiently for the men to understand why gas-air mixtures explode, what must be done to prevent explosive mixtures, and the practical steps in purging.

Job Training

Some companies have quite elaborate job-training programs covering a large variety of jobs. These training programs include the theory of such operations as gas-making, purification, residual processing, and the like, given in easy-to-understand terms, yet sufficiently technical that the men understand what takes place within the apparatus. The results speak for themselves in the way the men apply their knowledge to their jobs. In this day and age, we do not want robots in our plants but intelligent and informed men. If you have never done it before, consider the subject of purging for inclusion in your job training program.

Some companies may not have gone in much for purging. Some are small, and do not have occasion to do much purging. To them I suggest this: When a purging job arises, don't "just purge." Ask advice first. There are quite a number of companies that do much purging, who will be glad to give you the benefits of their experience, and will be pleased if you would visit them for suggestions.

The AGA has two booklets which cover the practical side of purging and which may be obtained from AGA headquarters in New York. These are being expanded but at the moment they are the best general purging instructions available.

Approval of Purging

For modern purging, it is necessary for the top men in the gas department of a company to be in whole-hearted accord with the idea and practice of purging. The initiative and impetus to employ purging as the only absolutely safe method for taking apparatus out of service and returning it to service, must originate with the head men. Their attitude, either for or against, will be reflected in the attitude and performance of all the men down the line.

Modern purging cannot be done half-heartedly. It requires top approval first, and approval by the men down the line will be a matter of course.

Packaged Steam Generators

Ten factors contribute to their popularity and make them valuable load builders

By F. W. HAINER

Cleaver-Brooks Co.

THE U. S. Bureau of Census' reports list some 60 basic industries requiring the use of steam to some degree. In some 20 of these industries steam is a major element in the manufacturing or process cost. It is used not only for direct process work but also for the heating of buildings and for providing hot water.

The present field of the packaged steam generator might be divided roughly into three parts. First, the so-called commercial or small industrial field with boiler sizes ranging from 25 to 100 hp; a second group, the middle industrial group, ranging between 100 and 500 hp, and a third group of larger industries with boiler loads ranging between 500 and 2000 hp. This excludes the field of large central station plants which ordinarily involve the use of solid fuel for which the present generator has not been designed.

The packaged unit is a self-contained assembly which includes the boiler and the boiler trim, the fuel burner, and the various electrical controls, designed or furnished by a single manufacturer. It may also have other features such as an integral boiler return system and it may have insulation and lagging as a part of the unit.

The conventional boiler, as the term is employed in this article, is either an HRT, Scotch, Fire-box type or vertical boiler employing natural draft, and where the application of the fuel burner, boiler trim and necessary controls is the responsibility of agencies other than the original boiler manufacturer.

The most common form of the packaged steam generator is the horizontal fire tube design, although some water tube or coil types are made, particularly in the smaller boiler sizes. The fire tube type is similar in actual appearance to the Scotch Marine but instead of the two-pass design, three or four passes are utilized so as to permit the greatest possible extraction of heat from the flue gases. Higher heat transfer or scrubbing of the heating surfaces is obtained by passing the flue gases through the boiler at high velocities. This is done by forced or induced draft.

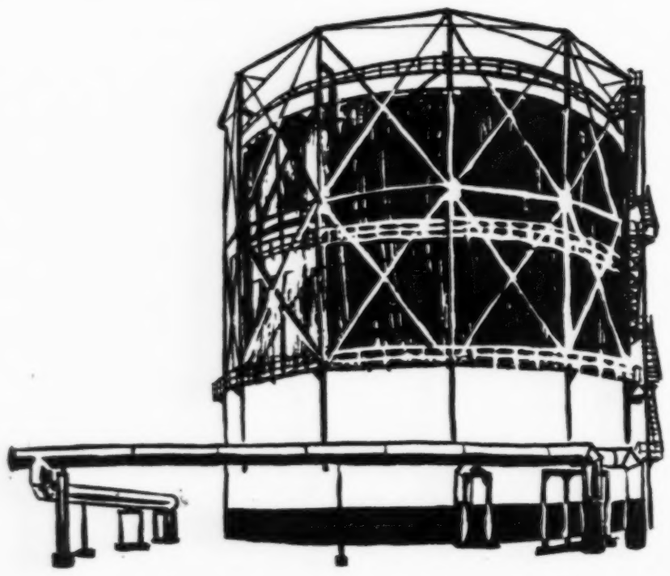
All of the components of the generator are selected and applied so that each works in proper relationship to other parts of the assembly. It can therefore develop a high overall efficiency with maximum simplicity of operation. The entire unit is easily mounted on a rugged frame which simplifies installation. It requires no expensive brick or steel chimney. Vent pipes of relatively small diameter are all that is needed to vent gases to atmosphere.

The fuel burner may employ either oil or gas. The burner necessarily includes all the controls, safety devices, valves, piping, and wiring. Burners are either fully or semi-automatic in operation depending on the type of fuel used and the manufacturer's recomendations. The usual pressure range is from 15 to 200 lb. Most manufacturers of this equipment guarantee a fuel-to-steam efficiency of 80% or over.

Advantages

Some of the factors which have helped establish the high acceptance of the packaged steam generator are the following:

1. Ideal for irregular loads.
2. Favorable investment cost.
3. Lower cost of producing steam.
4. Reduction in labor costs.
5. Lower maintenance.
6. Cleanliness and good appearance.
7. Portability.
8. Controllability.
9. Modern design.
10. Smoke prevention.



The Dayton-Faber Process

Gas-making method has many uses and requires less initial investment

By W. F. FABER

Consulting Gas Engineer

Hillside, N. J.

TONNAGE oxygen of about 95% purity can be produced today at relatively low cost for utilization in the manufactured gas industry. Several large plants are now under construction for production of tonnage oxygen for use in the chemical industry for synthesis of liquid hydrocarbons, and for use in the steel industry for the manufacture of steel by use of oxygen-enriched air.

With the advent of low-cost tonnage oxygen, it is now economically feasible to produce by continuous method high grade city gas from fuel oil by the novel method known as the Dayton-Faber oxygen oil gas process. Moreover, the Dayton-Faber gas generator is readily adaptable for the reforming of natural gases, such as methane, ethane, propane and butane or mixtures thereof, for the production of city gas of any desired heating value and specific gravity.

A total of 17 gas production tests was made with the 5000 cu ft/hr oxygen oil gas generator. The fuels gasified ranged from low grade gasoline to Pennsylvania straight run gas oil, Atlantic No. 2 fuel oil, Texaco No. 2 high sulphur oil, and Socony No. 3 cracked fuel oil. The gases produced ranged from 300 to 950 Btu per cu ft, specific gravities from .78 to .91.

Results of Tests

The results obtained from the tests with the Dayton-Faber oxygen oil gas process are interesting to the gas industry from the standpoint of range of heating values per cu ft, chemical analyses, and impurities present in the gas. The conversion efficiencies are high and the process is worthy of con-

sideration for producing "city gas."

In addition, the process and apparatus have the following advantages: Low investment cost, minimum of labor, continuous production, flexibility of operation for the production of oil gas or reformed gas of any desired heating value with the use of oxygen-enriched air.

The results of the reformed natural gas tests indicated that natural gas (96% methane) can be reformed to a 260-Btu gas of .64 sp gr and thence cold-enriched with straight natural gas to a 540-Btu gas or higher of approximately .62 to .65 sp gr reformed mixed gas, utilizing the Dayton-Faber gas generator which is readily adaptable for oxygen-oil-gas or reformed natural gas.

Moreover, the Dayton-Faber generator can be utilized, if desired, for the production of straight Dayton oil gas of 300 to 450 Btu or Faber reformed natural gas of 300 to 900 Btu —without the use of straight oxygen.

Petroleum Availability Will Rise

Committee forecasts material increase annually for next five years

By THE SUBCOMMITTEE ON LONG-TERM AVAILABILITY

National Oil Policy Committee
American Petroleum Institute

IT is estimated that total availability of petroleum and petroleum products for consumption in the United States will increase substantially during the 10 years 1949-1958, inclusive.

During the 5 years 1949-1953, inclusive, the availability of natural liquid hydrocarbons (crude petroleum and natural-gas liquids) produced in the United States is estimated to increase as shown in the accompanying table.

For comparison, the actual domestic production of these liquids in 1948 is expected to approximate 5.9 million bbl per day (5.5 million bbl daily of crude petroleum and 400,000 bbl daily of natural-gas liquids). The estimated 1953 rates, therefore, would be equivalent to an increase over 1948 of 1,060,000 bbl daily on the basis of the average estimate of availability.

Synthetics

Supplementing the natural petroleum liquids produced in the United States during the next five years, the estimated availability of petroleum products from synthetic processes, under foreseeable economic conditions, is relatively small, with the volume reaching approximately 30,000 bbl daily of oil products converted from natural gas by 1953. However, technically feasible and operable processes for the conversion of natural gas, oil shale, and coal to oil products have been developed, and large sources of supply of those raw materials exist.

Production of foreign petroleum is estimated to increase substantially during the five years 1949-1953, inclusive. Total estimated production of crude petroleum in the foreign nations of the Western Hemisphere (for use in those foreign nations and for export) is estimated to increase from 1,750,000 bbl daily in 1948 to 2,490,000 bbl per day in 1953, and in the Eastern Hemisphere (exclusive of Russia) from 1,500,000 bbl daily in 1948 to 2,520,000 bbl per day in 1953. Although it was beyond the scope of the study to estimate future distribution of this foreign oil between consuming areas of the world, these increases in total foreign production should increase the availability from these sources for consumption in the United States. In this connection, it is important to note that consumption within the principal foreign oil-producing countries is relatively small, and the largest part of the output of those countries is available for use in other areas.

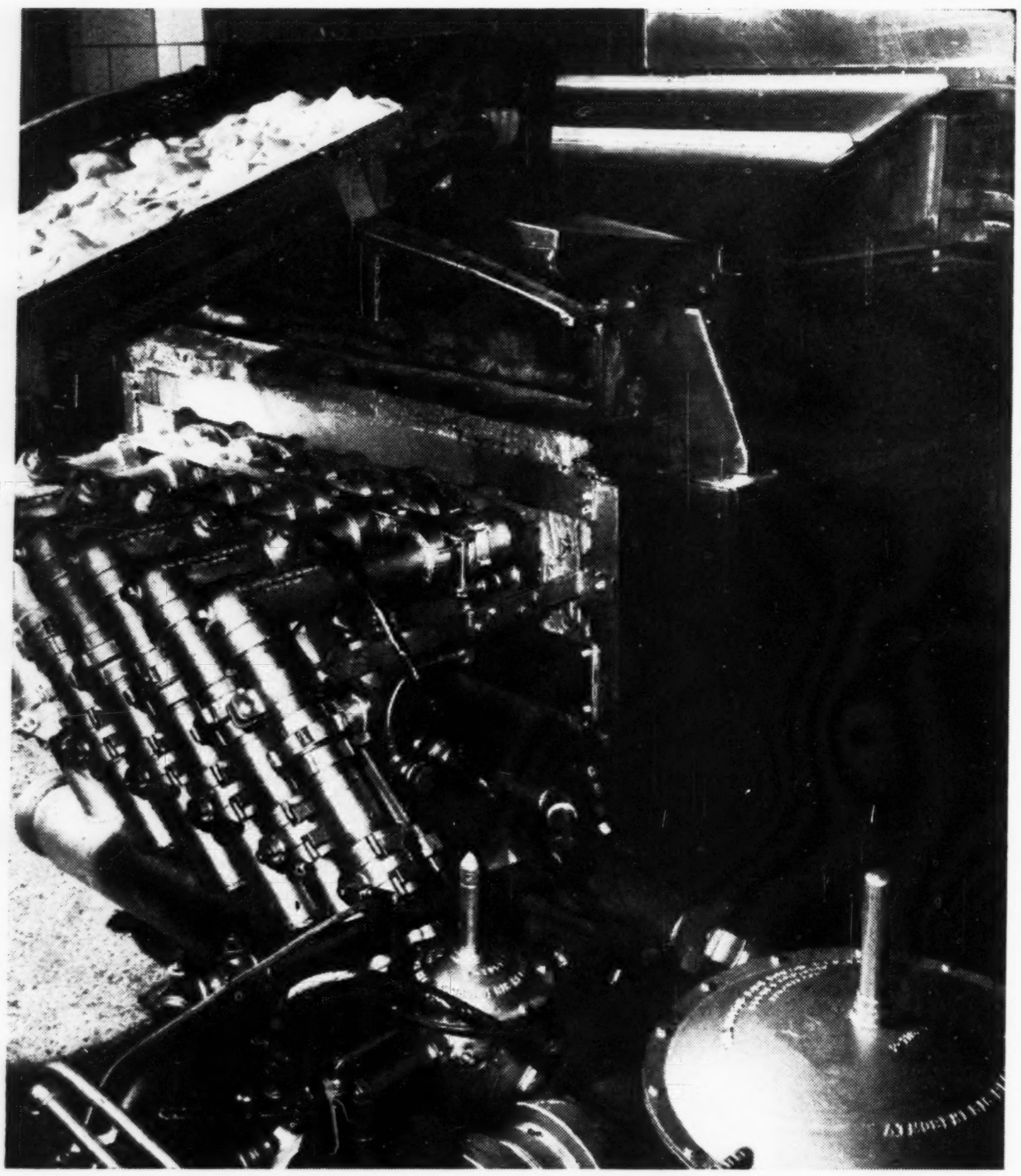
Question Mark

For the second five-year period 1954-1958, adequate information on which to base detailed estimates of availability of natural liquid hydrocarbons produced in the United States will not be available for several years. From the best data now obtainable, no significant decline from the 1953 estimated rates is anticipated during following five years, but it is impossible to foresee definitely at this time the probable trends. However, as these trends become defined, and if a moderate decline in domestic output of natural liquid hydrocarbons should be indicated, supplementary sources of petroleum and its products are estimated to become available in larger volumes if needed. Large reserves of the raw materials for the synthetic production of oil exist in the form of natural gas, oil shale, and coal. Future availability from these sources may be considered to be limited primarily by the practical considerations of the need for such production and the time, materials and capital required to construct necessary facilities. Under the conditions set forth in the report, the availability of petroleum produced in foreign countries in both the Western and Eastern Hemispheres is estimated to increase further during the second five-year period and to provide additional supplementary supplies for consumption in the United States if needed.

Proved reserves of natural gas are at a relatively high ratio to consumption and, as distribution facilities are expanded, it is estimated that larger quantities of this fuel will be available to supplement liquid petroleum products in supplying the nation's energy requirements.

TABLE 1. AVAILABLE NATURAL LIQUID HYDROCARBONS

	Problable Range		
	Lower (Bbl Daily)	Upper (Bbl Daily)	Average (Bbl Daily)
1949	6,120,000	6,300,000	6,210,000
1950	6,310,000	6,630,000	6,470,000
1951	6,460,000	6,920,000	6,690,000
1952	6,560,000	7,140,000	6,850,000
1953	6,600,000	7,320,000	6,960,000



Six sealed-in tunnel-type gas burners supply heat for frying. Complete thermostatic control maintains temperature of about 425°F.

Potato Chips - - 50 Tons Weekly - - Fried With Gas

By WILLIAM HELME

AN average of 100,000 lb of golden crisp, tasty potato chips is turned out every week at the plant of the Special Foods Co. in Chicago, requiring 10 carloads of U. S. No. 1-A especially selected potatoes. Two continuous conveyor type gas-fired potato chip machines are used in the operation. Eighteen 100-lb bags of potatoes are required per hour for each machine and the plant operates from 18 to 20 hours a day. Each week 100 bbl of high grade cooking oil are utilized for transforming the raw potatoes to the finished product.

Exclusive

The operation of the potato chip machines really starts in the storeroom. Here, the bags of choice potatoes are opened one at a time and the contents dumped onto a mechanical shaker to remove the loose dirt. By means of an elevator conveyor they are automatically fed into a large washer where they are thoroughly washed. As they emerge from the washer, they are carried by conveyor into a hopper to be peeled. An automatic, abrasive peeler capable of peeling 60 lb of potatoes at one time is used.

Looking shiny white after the washing and peeling treatments, the tubers continue by conveyor to another hopper where they are carried by a bucket elevator into the slicing machine. On coming out of the slicing machine, the chips enter a long cage-like washing machine where about 90% of the starch is removed. Still on the move, the chips pass through several water sprays and on to a draining conveyor.

Now comes one of the most important phases of the operation when the chips are dropped into a huge kettle containing a selected grade of hot cooking oil heated by six sealed-in tunnel type North American gas burners, each equipped with an aspirator. See *Fig. 1.* A single zero governor is used to regulate the gas supply, each machine having a maximum capacity of 4400 cu ft of 800-Btu gas an hour. Air is supplied from a North American centrifical blower at ½-lb pressure. Complete thermostatic control is employed to maintain a temperature of about 425°F in the frying process.

Within the cooking chamber, which is completely enclosed, the chips are moved toward the discharge end by means of three flat perforated rakes with small steel pins underneath. These rakes move back and forth in such a way as to push the chips at a steady rate onto an inclined conveyor where the excess oil is drained off. It takes about two minutes for the chips to pass through the cooking chamber.

On reaching the top of the inclined conveyor, they continue on through a drying chamber and are then automatically salted. Emerging from this process, the golden crisp chips moving along on the conveyor are inspected by girl operators who pick out the so-called "brownies" and raw chips.

They are now ready for the packaging department where a crew of nimble-fingered girls quickly packs them into attractive wax glassine bags and metal cans. The individual containers are then packed into heavy corrugated cartons and sent to the shipping department. A fleet of fast 20-ton trucks is on hand to whisk them away at frequent intervals to the company's warehouses around the city from which points they will be routed to the thousands of dealers and distributors in Chicago's metropolitan area.

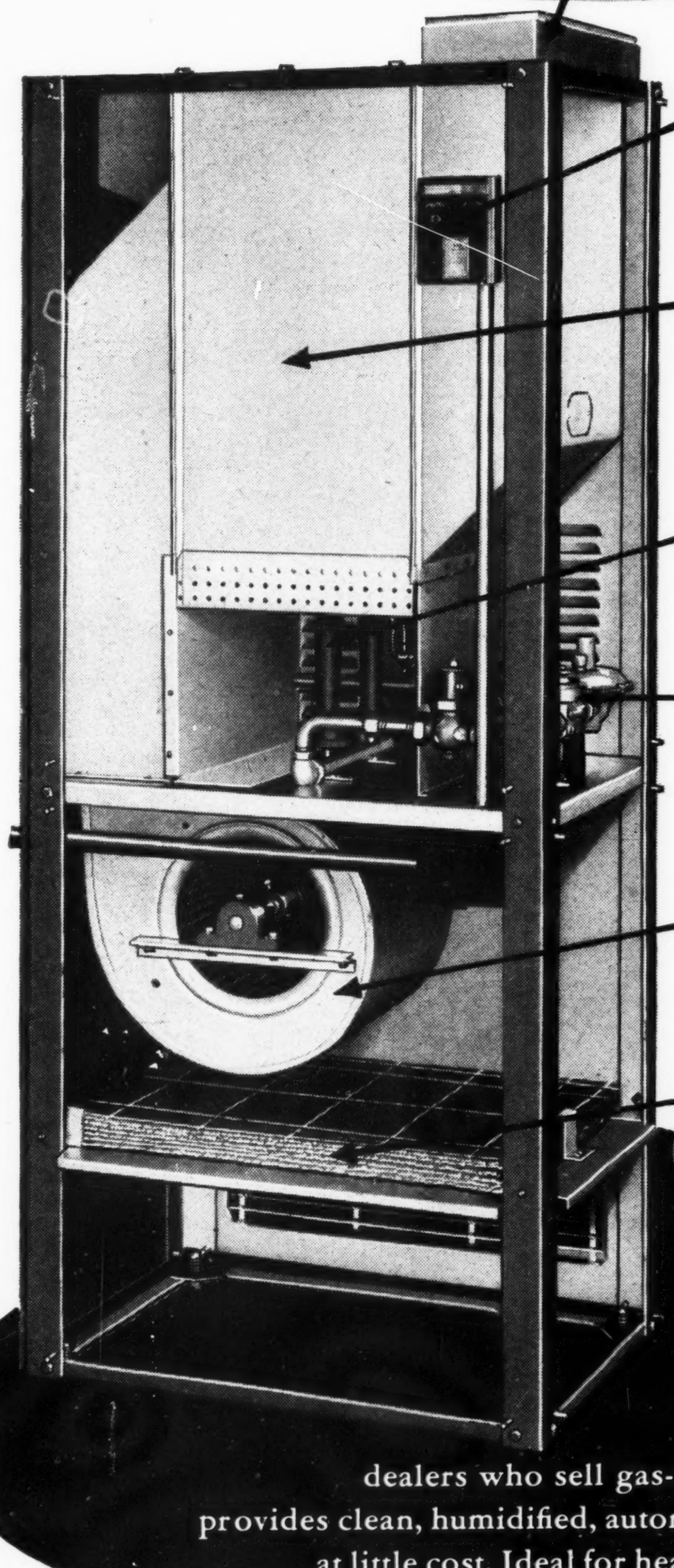
One of the unusual features of this installation is that the products of combustion are carried by down draft from the combustion chamber into a brick-lined flue buried in the ground under the operating floor and from there pass into a 60-ft stack located just outside the plant. This method was used to eliminate unsightly flues and duct work within the building as well as possible excess heat from them.

THESE FEATURES help you sell

HUMPHREY
No. 75
HEAT CABINETS

Healthful humidity is supplied with this automatic humidifier. Specially processed evaporating elements quickly transfer moisture to the heated air.

Combination Fan and Limit Control provides automatic operation of blower. Incorporates summer setting for using fan only for ventilating purposes.



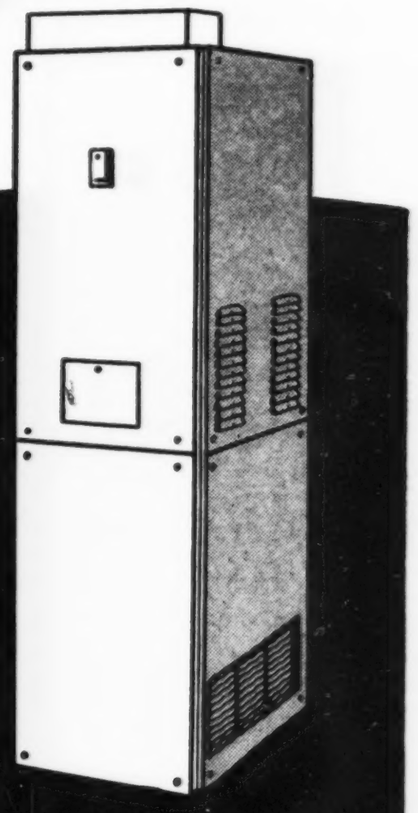
Located within inside panels of heater is the heat exchanger, made of heavy gauge steel electrically welded to form a single integrated assembly.

Twin gas burners with precision drilled ports, micro-adjustment air shutters and scientifically designed venturi assure high operating efficiency.

Simple, positive and easily accessible gas controls, incorporating the famous Humphrey-Baso Safety Pilot Control, govern the operation of the heater.

A powerful blower type fan, statically and dynamically balanced, driven by a rugged motor, circulates the warm air to every point where heat is needed.

Dust, dirt, lint and other impurities are quickly removed from the air by this efficient filter. Filter cartridge is of the "throwaway type" and easily replaced.



Stylish and dependable, the Humphrey Heat Cabinet is gaining favor everywhere among dealers who sell gas-fired heating equipment. This fine heater provides clean, humidified, automatically controlled Forced Air Heat at little cost. Ideal for heating homes, stores, shops, restaurants and countless other places. Write today for complete literature.

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ASSOCIATIONS

Science Saves

Technology promoting gas conservation, compact told

By O. D. HALL

CONSERVATION of natural gas is being pushed forward more rapidly in the oil industry by studies being made by the Interstate Oil Compact Commission and applications of new scientific methods by operators. This was developed during the winter meeting of that body at Wichita, Kan., Dec. 9-11, at which 21 states, all members of the compact, were represented.

Recent advances in secondary recovery and unitization methods and practices and extensions to new fields have played a most important role in this story of progress, it was brought out.

George Fancher, professor of petroleum at the University of Texas, stated that 5.6 trillion cu ft of gas was produced in 1947 as a result of advanced conservation methods, and greater amounts will have been produced by the end of 1948. Probably no more than 8 or 10% of this gas is wasted by flaring, the remainder being conserved by use for fuel, secondary recovery operations and for other useful purposes.

In spite of the litigation involving federal court injunctions, now pending in the courts, and more stringent orders of the Texas Railroad Commission restricting flaring and other alleged wasteful processes, Mr. Fancher reported that in Texas, which produced 45% of all gas produced in the United States in 1948, about 65% was marketed for fuel and manufacture of useful products, 20% was used for secondary recovery of petroleum, and only 15% was flared. Of the 20% used for secondary recovery three-fourths was used for maintenance of pressure and one-fourth for repressuring.

Unitization of oil and gas fields as a measure of conservation and more efficient business and recovery practices has made remarkable progress in recent years. Some 100 unitized projects are known to be in operation. Operators in 12 states reported the unitization of 226,000 acres in 24 fields, with 9595 wells producing oil and gas. Gas is being used in some of these projects to maintain pressure. Reports indicate that recovery of oil from 18 fields in seven states will be increased 12.5% to 100% from nearly 129,000 productive acres.

Devoting its report at the Wichita meeting largely to development of late scientific methods of increasing and conserving the production of gas, the research and coordinating committee of the commission revealed that the coal hydrogenation plant of the Bureau of Mines at Louisiana, Mo., is being designed for the high pressure hydrogenation of coal and the conversion of the liquefied coal to gasoline. At the bureau's Fischer-Tropsch demonstration plant the largest pulverized coal-oxygen gas-fired unit installation is being made.

The second underground coal gasification experiment of the Bureau of Mines and Alabama Power Co. at Gorgas, Ala., is expected to get under way between Jan. 15 and Feb. 1. It will be carried out at a deeper level and at much heavier air-pressures and higher temperatures. If the product gas is suitable a gas turbine will be operated. If heating values can be improved, hope is extended that underground gasification will offer a cheap source of synthesis gas, carbon monoxide and hydrogen. This is regarded as the number one problem in making synthetic liquid fuels manufacture economic. It is considered possible that coal can be "burned"

Calendar

January

Southern Gas Assn. Home Service Round Table—Tutwiler hotel, Birmingham, Jan. 14.

Southern Gas Assn. Home Service Round Table—Oklahoma-Biltmore hotel, Oklahoma City, Jan. 21.

AGA Home Service Workshop—Hotel Statler, Cleveland, Jan. 24-27.

American Society of Heating & Ventilating Engineers—Stevens hotel Chicago, Jan. 24-27.

International Heating & Ventilating Exposition — International amphitheatre, Chicago, Ill., Jan. 24-28.

Midwest Industrial Gas Council—LaSalle hotel, Chicago, Jan. 28.

March

National Assn. of Corrosion Engineers Annual Convention — Cincinnati, Ohio, March 7-10.

Oklahoma Utilities Assn. Annual Meeting—Tulsa hotel, Tulsa, Okla., March 17-18.

New England Gas Assn. — Hotel Statler, Boston, March 24-25.

Annual Safety Convention & Exposition—Hotel Pennsylvania, New York, March 29-April 1.

Mid-West Regional Gas Sales Conference—Edgewater Beach hotel, Chicago, March 29-April 1.

April

Industrial Accident Prevention Assn. Convention—Royal York hotel, Toronto, April 4-5.

Distribution, Motor Vehicle & Corrosion Conference—Netherlands Plaza hotel, Cincinnati, April 4-6.

Gas Appliance Manufacturers Assn. Annual Meeting—Broadmoor hotel, Colorado Springs, April 5-7.

AGA Sales Conference on Industrial and Commercial Gas—Andrew Jackson hotel, Nashville, April 5-7.

Gas Meters Assn. of Florida-Georgia Annual Meeting—Ponce de Leon hotel, St. Augustine, Fla., April 10-12.

Mid-West Gas Assn. Annual Convention — Hotel Fort Des Moines, Des Moines, Iowa, April 11-13.

National Assn. of Corrosion Engineers — Netherlands-Plaza hotel, Cincinnati, April 11-13.

AGA-EEI Spring Accounting Conference — Hotel Book - Cadillac, Detroit, Mich., April 11-13.

Southwestern Gas Measurement Short Course — University of Oklahoma, April 12-14.

Midwest Power Conference—Hotel Sherman, Chicago, Ill., April 18-20.

Southern Gas Assn. Annual Convention—Buena Vista hotel, Biloxi, Miss., April 20-22.

The Maryland Utilities Assn. Annual Meeting—Lord Baltimore hotel, Baltimore, April 22.

Indiana Gas Assn. Convention—French Lick Springs hotel, French Lick, Ind., April 28-29.

May

AGA Natural Gas Department Spring Meeting — French Lick Springs, Ind., May 9-10.

LPGA Annual Convention—Palmer House, Chicago, May 9-11.

AGA Industrial Gas School—Hotel Severin, Indianapolis, Ind., May 9-13.

AGA Executive Conference—Netherlands Plaza hotel, Cincinnati, May 12-13.

National Fire Protection Assn.—Fairmont hotel, San Francisco, May 16-19.

Pennsylvania Gas Assn., Annual Convention—Galen Hall, Wernersville, May 17-19.

AGA Production & Chemical Conference — Hotel New Yorker, New York, N. Y., May 23-25.

National Restaurant Exposition—Atlantic City, N. J., May 24-27.

The Natural Gas & Petroleum Assn. of Canada Annual Meeting—Hotel London, London, Ont., May 26-27.

National Assn. of Master Plumbers—Annual Convention & Home Comfort Exposition, Cleveland Public auditorium, Cleveland, Ohio, May 30-June 2.

June

Canadian Gas Assn. Annual Convention—Bigwin Inn, Lake of Bays, Ontario, June 16-20.

Michigan Gas Assn. Annual Convention — Grand hotel, Mackinac Island, Mich., June 24-25.

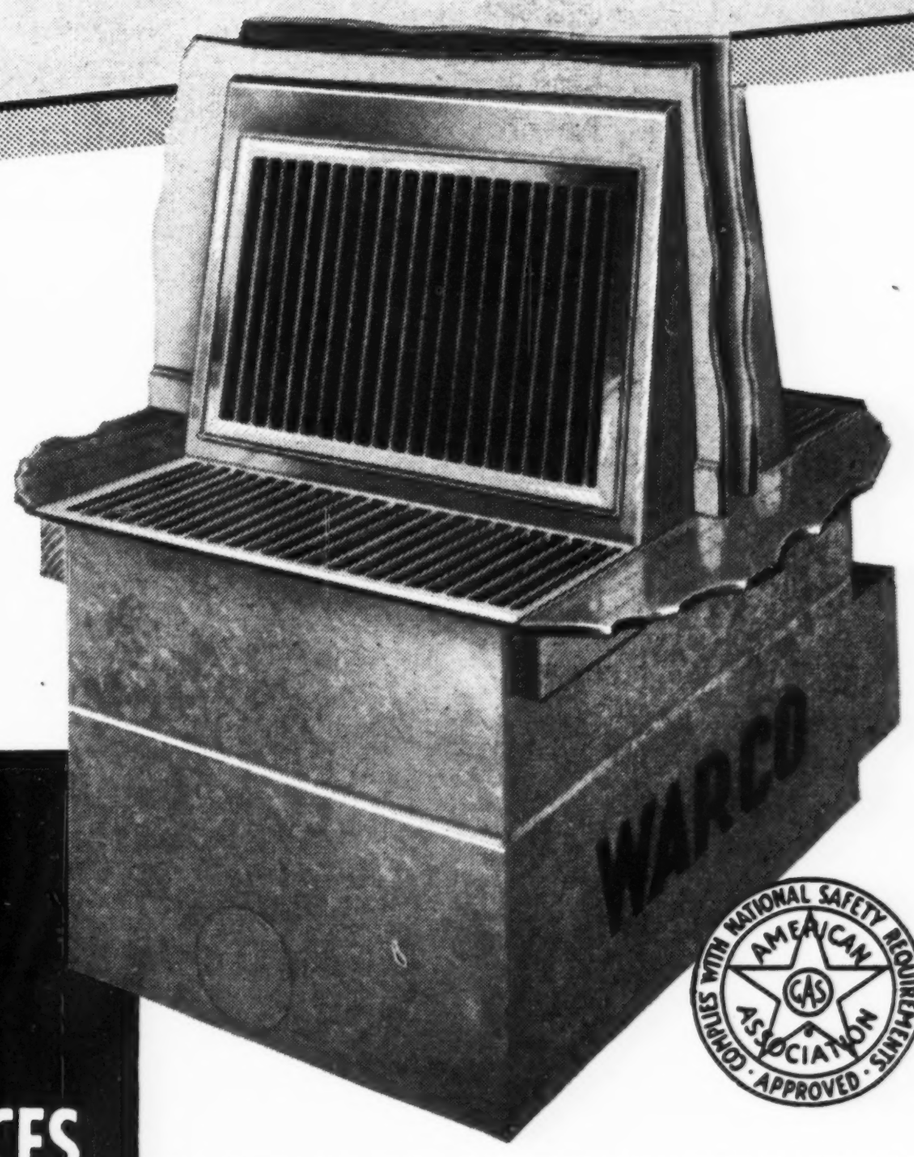
Mister Dealer:

You can keep furnace sales "hot" all year through with WARCO Low Cost Heating for the new home construction field.

PS: If you are not a WARD dealer it is profitable to be one. Write us today.

Contractors, home project developers and individual owners are all looking for quality heating installations that meet their low budget demands.

Many Ward dealers are cashing in on this great all-year market. They are beating the competition with WARCO Furnaces that provide plenty of heat, luxury features and a five-year guarantee at the lowest comparative cost.



WARCO

FLOOR AND DUAL FURNACES

WARD HEATER COMPANY 1800 W. WASHINGTON BLVD. LOS ANGELES 7, CALIF.

with highly superheated steam to produce a gas of 300 Btu's or better.

Conservation of gas has been advanced by recent development of scientific methods to determine which portion of a formation will produce gas only, oil only, or water, the engineering committee of the compact commission reported. These advances have made it possible to segregate by proper well completion practices the producing zones.

Among other technical advances reported by the engineering committee for the production and conservation of oil and gas were these:

Elimination of the former wasteful practice of open flow testing by back pressure method of determining the capacity of gas wells.

Construction of larger diameter transmission pipelines, designed to operate at higher pressures, making it feasible to market gas, which for economic reasons formerly could not be sold.

Methods of economically extracting hydrogen sulphide and other impurities from sour gas, with the production of pure sulphur as the important by-product, and an increase in the supply of pipeline gas.

More efficient methods for the manufacture of carbon black making it possible, from an economic standpoint, to utilize gas that otherwise was wasted.

Processes for conversion of gas to liquid fuels may utilize gas which otherwise might not be marketed.

Storage of natural gas to which air, propane and/or butane have been added. Beneficial results are an increase in the available supply of gas for peak load demands and the control of edge and bottom water.

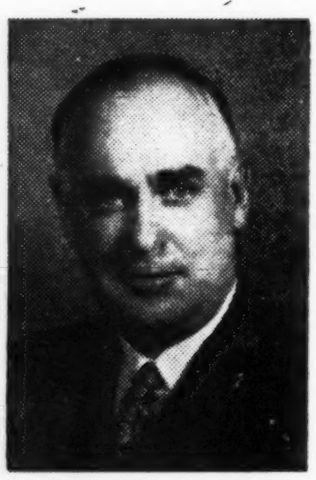
Several speakers emphasized that an adequate field price for natural gas has an important bearing on preventing its waste. Purchasers of gas in the field were advised that unless they fix fair prices at the well-head for gas, state legislatures soon to meet will go into the price-fixing business. An order of the Oklahoma Corporation Commission, which fixed the price of gas at the well at 7 cents per Mcf, now being tested in the supreme court of that state, was cited.

One of the very latest scientific methods which has an important bearing on the conservation of oil and gas, is the "Hydrafrac" method announced by Stanolind Oil and Gas Co.

The underground storage of natural gas which is a growing practice of recent years, has proved to be an important conservation measure not only in the prevention of the physical loss of billions of cu ft of gas but also from an economic standpoint. H. J. Wagner, engineer director, gas division, Public Service Commission of West Virginia, reported to the compact commission meeting. This is particularly true in the Appalachian region where the average gas well produces less than 50 Mcf a day. To shut in such a well or hold back the pressure of such a well by high line pressure not only reduces the total annual volume of gas which it produces but requires frequent bailing to keep it from being completely drowned out. Without underground storage thousands of these wells would have been abandoned.

Principal officers elected at the Wichita meeting were: Governor Frank Carlson, Topeka, chairman; Don T. Andrus, Bradford, Pa., first vice chairman; James McClure Jr., Sardis, Miss., second vice chairman and Earl Foster, Oklahoma City, executive secretary.

New GAMA and AGA Appointees



S. C. Gorman

R. T. Killian

L. A. Brandt

Robb Quinby

Destined to spearhead the "most comprehensive, far reaching and all-inclusive cooperative sales, advertising, and promotional campaigns ever developed for the automatic gas water heater industry," Stanley C. Gorman of Los Angeles last month was appointed sales promotion director of GAMA's gas water heater division.

Former dealer promotion representative for Southern California Gas Co., ex-gas appliance merchant, and once a Richfield Oil Co. executive, Mr. Gorman is widely known and well versed in the gas appliance merchandising field.

* * *

R. T. Killian, manager of the market development and research department of the Bryant Heater Co., Cleveland, was recently elected to the chairmanship of GAMA's Marketing committee. He succeeds Marc W. Pender, American Stove Co.

Mr. Killian is a member of the American Marketing Assn. and the American Statistical Assn., and was formerly vice chairman of the GAMA committee.

New chairman of AGA's personnel committee is Leslie A. Brandt, who is assistant to the vice president and director of employee relations of The Peoples Gas Light and Coke Co., Chicago. Mr. Brandt, chairman of the AGA's Great Lakes personnel conference, was appointed by President Robert W. Hendee to succeed C. G. Simpson, retiring chairman.

The Great Lakes personnel conference was organized last year, under sponsorship of AGA's personnel committee, and included representation from approximately 25 companies.

* * *

Brooklyn Union Gas Co.'s rate department manager, Robb Quinby, has been selected by AGA President R. W. Hendee to head the association's rate committee for the next year. The committee is charged with collecting and disseminating data and procedures on rate matters, and is considered one of the most important functionaries of the association in a year when rate adjustments are widespread.

Home Service Workshop Planned

The AGA home service committee shown at its planning session Nov. 9.

A 3½-day program which will cover all phases of home service operation has been planned for the annual AGA Home Service Workshop scheduled for Jan. 24-27 at the Statler hotel in Cleveland. The event is sponsored by AGA's home service committee, which held a planning session under the direction of Chairman Eleanor Morrison, Michigan Consolidated Gas Co., at Grand Rapids Nov. 9.

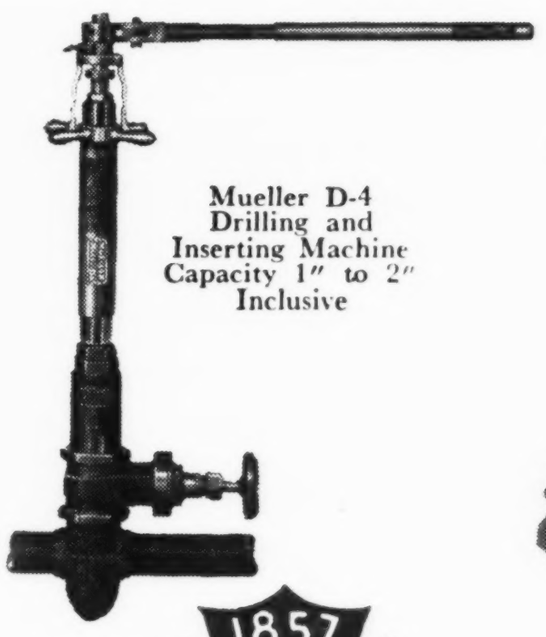
Addresses will include "Factors in Sales Promotion" by Raymond J. Vandergriff, general sales manager, The Laclede Gas Light Co., St. Louis; "Fundamentals on the Use of Gas," by Edward Nelson of Rochester Gas & Electric Corp.; "The Pen and Pencil of Home Service," by Florence L. Harris, home economics editor of the *Cleveland Press;* and "Promotion of the Laundry Dryer" by Betty Olson, Hamilton Manufacturing Co. and Mary Hall, Elizabethtown Consolidated Gas Co.

FOR THAT EXTRA MARGIN OF

SAFETY

USE MUELLER NO-BLO SERVICE TEE 10410

Mueller H-10410
Welding Tee



Mueller D-4
Drilling and
Inserting Machine
Capacity 1" to 2"
Inclusive

Mueller E-4
Drilling and
Inserting Machine
Capacity $\frac{7}{16}$" to 1"
Inclusive

There's an *EXTRA* margin of safety when you use Mueller H-10410 NO-BLO Service Tees because they eliminate any necessity of the gas blowing or escaping when used with the Mueller E-4 or D-4 Drilling and Inserting Machine. These Tees have both an INSIDE and an OUTSIDE thread at the top. The Tee is first welded to the main and the service line completed. A Valve and the Drilling Machine are screwed on to the OUTSIDE thread of the Tee, the main drilled through the Tee and then a plug inserted into the INSIDE thread. The Machine and Valve are removed and a cap put on the OUTSIDE thread to effect a double, leak-proof seal. In these Tees, a machine-inserted rubber shut-off tool may be placed, stopping off the service under pressure with complete safety. The work is all done with the line under pressure and with complete control at all stages of the operation.

Mueller Welding Tees will handle Low, Medium or High Pressures and are made in sizes ¾" to 2" inclusive. Be sure to specify size and type of inlet and outlet connections when ordering.

DEPENDABLE SINCE 1857 FULLY WARRANTED
OUR 91st YEAR

MUELLER CO.

MAIN OFFICE AND FACTORY.....DECATUR, ILLINOIS
OTHER FACTORIES: *Los Angeles, Cal.; Chattanooga, Tenn.; Sarnia, Ont. Canada*

EXPANSION

Schedule Beaten

Tennessee Gas nearly doubles deliveries

Tennessee Gas Transmission Co.'s trade-out pipe deal with Trans Arabian, among other companies, and some rapid installation work brought Tennessee's 1948 construction program in ahead of schedule. The company is now delivering in excess of 605 MMcf daily, which indicates a lessening of hardship in the Appalachian area, in particular. Tennessee's natural gas deliveries to the East were almost doubled in the last year.

During 1948 710 miles of main pipeline loops and 83 miles of lateral line to the east Texas Carthage field were installed, while 74,000 additional compressor horsepower was added in compressor stations. Added to Tennessee's existing facilities, this gives the company a total of 2500 miles of large diameter pipe and compressor stations with an aggregate of about 217,000 hp.

The FPC has given Tennessee the go-ahead to increase its capacity to 660 MMcf daily; this expansion will be made in 1949.

Latest large scale agreement for Tennessee is a 110-MMcf daily delivery pact with Manufacturers Light and Heat Co. of Pittsburgh.

Wyoming-Utah Line

Consumers in the Salt Lake City and Ogden areas are now receiving natural gas from Mountain Fuel Supply Co.'s Church Buttes field in western Wyoming, where the company recently completed a $100,000 dehydration and separation plant.

A good flow of condensate—nearly 49 degree gravity—is flowing from the wells, according to company officials. The field is owned by Mountain Fuel (51%) and Union Pacific (49%). Estimates have been made that the two companies have invested more than $5 million in the field, which is located in Uinta and Sweetwater counties.

At Medicine Buttes, near Granger, Wyo., four wells averaging 13,000 ft in depth, all big potential producers, have been brought in on Union Pacific property. Three more are in various stages of drilling. This section of Wyoming's gas fields is co-operated by Mountain Fuel, with Union Pacific.

A little oil has been found in this area, but the accent continues to be on gas, of which there is enough, according to reliable sources, to support a pipeline to California.

Underground Pipe Storage

By the end of 1949 the Public Service Co. of Northern Illinois expects to have finished underground storage facilities that will hold more than 141 MMcf of natural gas. Present capacity is 95 MMcf, all held in buried pipe at 2240 lb pressure.

The first installment of the company's storage system, a 1¼-MMcf unit near Kankakee, Ill., was completed just two years ago. The company now has a unit near Mt. Prospect, Ill., holding 74 MMcf, and a 20 MMcf capacity unit near Matteson, Ill. Major addition during 1949, 46 MMcf, will be made at the Mt. Prospect site.

New Line to Illinois

The Mississippi River Fuel Corp., St. Louis, has asked FPC authorization to construct and operate a 650-mile line from Farmerville, La., to northern Illinois. Estimated cost has been set at almost $90 million. The new line would increase the company's daily delivery capacity by 500 MMcf, to a total of approximately 766 MMcf.

As outlined by Mississippi River Fuel, the project encompasses two major phases:

1) A 205-mile pipeline from Belleville, Ill., to Genesee, Ill., this section to be connected by a 17-mile line to the Columbia, Ill., measuring station.

2) After completion of this section, a 434-mile line from Farmerville to Belleville. Both lines will use 26-in. pipe.

The sales capacity at Belleville should be 350 MMcf when compressor stations (126,200 hp) are installed.

The company has proposed an alternate 235-mile line for the northern section from Belleville to a point near Joliet, Ill. Cost of the project under this plan would be upped about $2 million.

Present plans to finance the project call for additions to debt and issuance of capital stock, with a definite program yet to be decided on. Completion date for the entire project is scheduled for 1954, and will give the company three main lines, two serving the St. Louis area and the third northern Illinois, a new area for Mississippi. Resale in Illinois will be handled by either Natural Gas Pipe Line Co. of America, or Chicago District Pipe Line Co.

SoCounties Expands

Gas drawn from Southern Counties Gas Co.'s Texas-California pipeline is now in use in two large California population centers. Valves were opened Nov. 26 in the Pasadena-Alhambra area, marking completion of a 30-in. lateral, and a celebration was held in El Centro Dec. 10 officially to inaugurate the introduction of natural gas to the Imperial Valley and its major cities, Brawley, El Centro, and Calexico. Contractors have been invited to inspect the route of the proposed line to Holtville, another valley town.

Alabama Lines Okayed

Southern Natural Gas Co. has the final FPC okay on its $865,160 project to construct and operate additional main and branch loop lines in Alabama. The main line loops are intended to up capacity between Birmingham and Atlanta, while the proposed branch looping line wil boost the delivery capacity of the Montgomery branch line approximately 3.5 MMcf daily.

Temporary authorization was given Oct. 29.

Port Stanley in Operation

The $2½ million oil-gas plant at Port Stanley, Ontario, is now in operation. Dominion Natural Gas Co. Ltd. expects that its 6 MMcf daily capacity will allow all of Dominion's present customers to be supplied present requirements.

The new plant uses the "Twin Generator" process developed by Gas Machinery Co. of Cleveland, and requires approximately 72,000 gal of oil daily. Oil storage on the plant's premises amounts to 7 million gal, or enough to supply supplemental gas for one whole winter without additional shipments. Dominion also has a propane plant at Brantford which can be coordinated with the Port Stanley plant, combined output at full capacity amounting to 10 MMcf per day.

Construction of the plant was begun early last spring, with the first gas being produced in November.

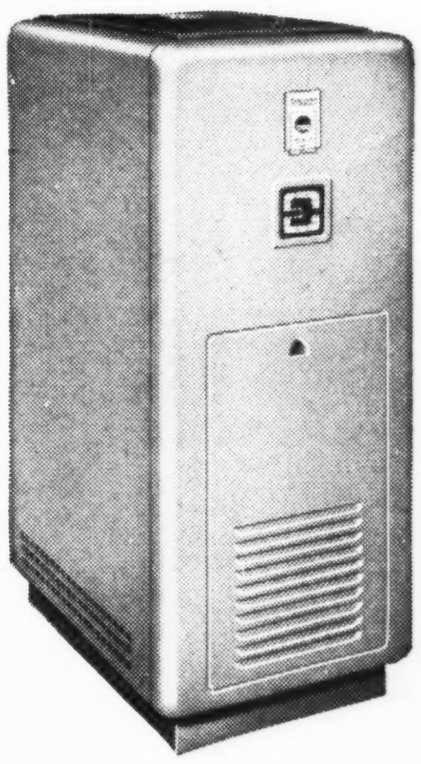
S. B. Severson, Dominion president, remarked at the formal inspection ceremonies that "(this) construction . . . is not the final solution of the desirable objective; namely, a further enlarged supply of gas for (our) customers. We are still hopeful that arrangements can be made to import natural gas from Texas where huge supplies are available. The . . . company has plans and rights of way completed to bring gas to Canada via pipeline over the Niagara river . . . These plans are now dormant because of the inability to obtain a U. S. export license."

R. O. Montrief (r.), president of the Institute of Gas Heating Industries, congratulates Paul E. Martens, superintendent of installation for the California Heating and Air Conditioning Co. Mr. Martens is one of 115 southern California journeyman heating installers who recently completed an 8-week course at the Serviceman's Gas Heating School. The course was jointly sponsored by the Institute, a non-profit trade association, and the SoCal Gas Co.

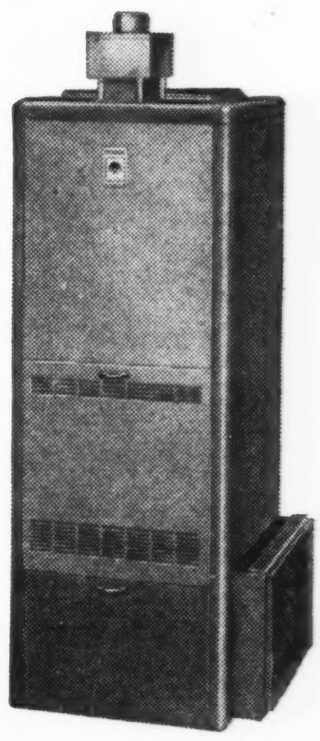
When she asks your opinion about gas heating equipment...

■ We hope you'll tell her about American-Standard. For whether she wants radiator heating, warm air heating, or winter air conditioning, American-Standard Heating Equipment will bring her maximum comfort from every cubic foot of gas.

When you recommend American-Standard products, you can be sure that their smart appearance, outstanding performance and trouble-free operation will back you up in making another satisfied customer for gas heating. **American Radiator & Standard Sanitary Corporation**, P. O. Box 1226, Pittsburgh 30, Pa.

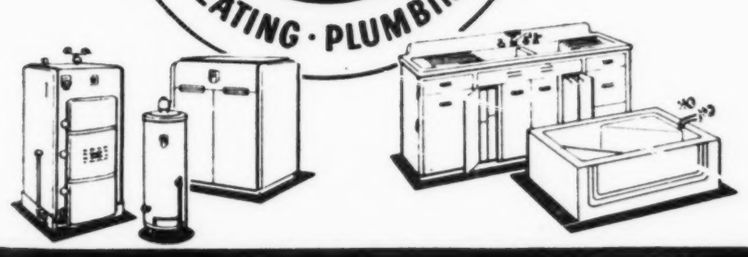


The **EMPIRE** Gas Boiler has all the features essential to efficient performance. Patented pin type cast iron sections rapidly and effectively absorb heat from the rising columns of hot gases and transfer this heat to the water within the sections. Water-filled sections entirely surround combustion chamber and permit installation of boiler on the same floor as radiators, if desired.



The **CHIPPEWA** Winter Air Conditioner is an efficient, economical unit which is ideal for installation in utility rooms, closets, or other restricted locations in small homes. It features a durable cast iron heating element and an attractive jacket finished in Placid Two-Tone Blue. Has a capacity of 48,000 Btu at bonnet.

AMERICAN-Standard
HEATING · PLUMBING



AMERICAN-Standard
First in heating . . . first in plumbing

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILER • ROSS HEATER • TONAWANDA IRON

Seems like almost everybody is reading about the Servel Gas Refrigerator

Servel's 1949 national advertising reaches 51,710,386 readers in the nation's favorite family magazines

During the next twelve months, it will be hard for your prospects *not* to read about Servel. Four-color, full-page Gas Refrigerator ads will appear 76 times in ten of America's best-read family magazines. These magazines are bought and kept . . . read and re-read . . . and used as buying guides by one-third of the nation's population. More important still, it's in this portion of the population that the worthwhile refrigerator prospects are found.

The *most* worthwhile prospects are attracted by Servel ads . . . according to readership studies. So when Servel ads, which prospects like to read, appear in magazines which the same prospects like to read, something is bound to happen. And that something is more and more *Gas Refrigerator* prospects!

But prospects aren't customers . . . yet! And they won't be until *your* advertising, *your* promotion, and *your* salesmen go to work and *sell* them. For all final sales are local. And only *you* can make final sales.

Servel Inc.

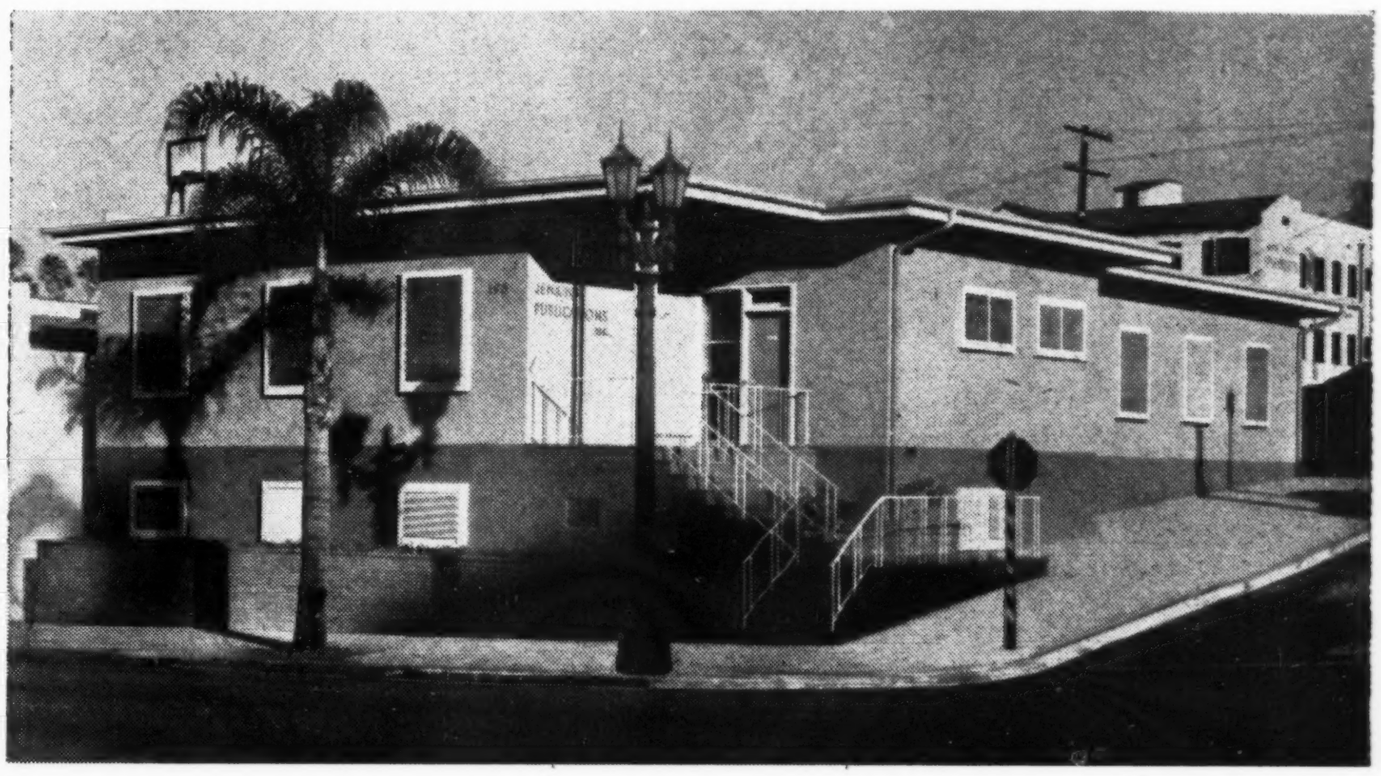
EVANSVILLE 20, INDIANA

Brooklyn Has New Holder

Brooklyn Union Gas Co.'s new 10.6-MMcf capacity holder at its Jamaica plant, one of the only two all-welded steel waterless holders in the world, was recently formally placed in service, along with a new compressor station equipped with two 800-hp diesel engine-driven gas compressors with four 30-in. x 14-in. double-acting compressor cylinders.

Scranton Operation Set

The Scranton (Pa.) plant of the Scranton-Spring Brook Water Service Co. is expected to be in operation by the fall of the year. It will house a fully automatic Semet-Solvay reverse flow carbureted water gas machine.



This modern building has been the new home of *GAS* and its affiliated publications since Oct. 15. The two-story structure, which contains 6500 sq ft of floor space, is located at 198 So. Alvarado St., Los Angeles.

A Dec. 17 open house celebration was attended by aprpoximately 300 leading men in the gas industry in the southern California area. Refreshments were served from the first floor model kitchen, which is equipped with a gas range and a gas refrigerator. Hot water is provided by a gas heater, while the last of the "Four Big Jobs" is done by two gas-fired, forced-air furnaces.

FINANCIAL

Rate Roundup

Assets hold key to rate increases

Rate raises were all bound up with asset estimation this month in Oregon and Ontario, while California companies were having trouble with escalator clauses in their contracts.

Portland Gas & Coke Co. should receive approximately $\$^3/_4$ million more revenue annually with a recently granted increase affecting lower bracket rates. PG&C's net operating income has been skidding for some time, with a return of only 1.97% on the original net cost of its utility plant, plus working capital, in the year ending Dec. 31, 1947. Estimated loss in November of 1948 was $50,000.

At the time of the rate increase, the Oregon public utilities commissioner also ordered the company to report on the possibility of removing at least part of its restrictions on new gas furnaces and industrial and commercial installations.

Union Gas Co. of Chatham, Ont., and its subsidiaries, *Windsor Gas Co. Ltd.*, and *City Gas Co., London,* were allowed rate raises by R. S. Colter, Ontario gas referee. The company asked an 8% return on its assets, opposing municipalities asked that the company be allowed only 6%, and the referee settled for 7%. The company's claim that the value of its assets should be based on their cost of replacement today was disallowed, the referee ruling that the base should be the original cost, thus reducing estimates of assets from $28 million to a little more than $20 million.

Net domestic and commercial rates now range from 50¢ for the first 100 cu ft consumed to $1 per Mcf for all over 10 Mcf.

Pacific Gas & Electric Co. and *Coast Counties Gas & Electric Co.* thought they were going to be able to raise their rates Dec. 12 under the fuel oil price escalator clause in their contracts, but the California public utilities commission has suspended the boost. The action was taken after the California Manufacturers Assn. filed a protesting petition with the commission. Hearings are set for Jan. 12 and Jan. 26.

Jacksonville (Fla.) Gas Corp. has asked a federal court for an injunction against the City of Jacksonville that seeks to halt the city from enforcing a recent decision of the city commission which ordered a lowering of consumer rates. Jacksonville Gas has contended that the proposed cut would allow the company a meager 1.9% return on its investment. Total value of the company was set at $5,487,000.

In the last two years the corporation has been jolted with increases of 69% in the cost of oil, 20% in the cost of coal, 59% in the cost of coke, and a 9% boost in taxes. Labor got a 10¢ an hour boost in Sept., 1947, and the company is now facing another demand, this one for 25¢ an hour.

Gas Revenue Jumps

Third quarter gas sales revenue jumped 9.3% over last year's figure, which totaled $283 million, according to the AGA. Natural gas revenues were about $171 million, a 13.7% rise; manufactured gas $94 million, a 7.4% rise; while mixed sales fell off 13.9%, to $18 million.

Manufactured gas sales declined due to the many changeovers to natural gas, but rate increases kept sales revenue up. Mixed gas sales, revenues, and customers all declined for the same reason.

Industrial revenues made the highest percentage gain, at 12.3%, followed by commercial revenues at 11.1% and residential at 7.0%.

In the year ending Sept. 30, revenues totaled $1.5 billion, an 11.7% increase over last year's volume.

October's sales were set at 2,378,446 therms, an increase of 10.5% over the total in October, 1947. Natural gas sales increased 12.2% in October, totaling 2,128,632,000 therms. The AGA's index of gas sales at the end of October stood at 203.5% of the 1935-1939 average.

For the 12-month period ending Oct. 31 total sales were 31,751,284,000 therms, a gain of 9.9% over the previous year and falling slightly under the comparative gain at the end of September.

Big Lines Reap Profits

Tennessee Gas Transmission Co.'s fourth quarter profit sharing will amount to $.35 a share on common stock and slightly more than a dollar a share on preferred stock. Total amount of dividends is $1,375,416.67.

The company's net earnings for the third quarter of 1948 were $1,524,497.

United Gas Corp. has announced its consolidated net income for 1948's third quarter as $3,143,155. Net for the year ending Sept. 30 was $18,968,191.

Interstate Rate Confab

The FPC has granted a limited rehearing set for Feb. 14 on its order directing Kentucky West Virginia Coal Co. to reduce its interstate wholesale rates. Taking 1945 operating revenues for its yardstick, the FPC ordered a reduction granted to Louisville Gas & Electric Co. and Pittsburgh and West Virginia Gas Co., Kentucky West Virginia wholesale customers, amounting to more than $\$^1/_2$ million. If the FPC approves Kentucky West Virginia's thesis that 1948 would be a better year to use as a yardstick, the company stands to get back almost $200,000 of

the reduction. Pending the rehearing, the disputed dollars will rest in a segregated reserve, by FPC order.

FPC Makes Like SEC

The FPC has ruled that $50 million of first mortgage bonds to be offered by the Tennessee Gas Transmission Co. must be sold at competitive bidding. This is the first time in the history of the natural gas industry that such a ruling has been handed down by the FPC, a prerogative usually reserved for the SEC.

Tennessee is planning construction of two new legs in its system, 909 miles along its present facilities in the area between Texas and West Virginia, and a 395-mile supplemental transmission line from northeastern Kentucky to Buffalo.

Action was taken under Sec. 7(E) of the Natural Gas act, as amended in 1942, and resulted from an intervention by Halsey, Stuart & Co., New York investment bankers, while the FPC was considering allowing the new construction and the bond issue.

Since 1945, all security sales for Tennessee Gas have been handled by Stone & Webster Securities Corp. (a subsidiary of Stone & Webster Inc.) and White, Weld & Co. The two companies, according to the FPC, are the predominant stockholders in Tennessee Gas.

September Sales Up

September shipment figures for gas heating and cooking equipment, issued by the department of commerce, show increases when compared to August figures for all types of equipment except water heaters.

		UNITS	VALUE
Warm air furnaces			
	Sept.	23,714	$ 4,243.953
	Aug.	20,792	3,594,047
Floor furnaces			
	Sept.	46,373	2,400,297
	Aug.	37,759	2,021,101
Domestic Heating Stoves			
	Sept.	254,305	3,691,392
	Aug.	277,492	3,464,257
Domestic Cooking Stoves and Ranges			
	Sept.	239,938	20,268,890
	Aug.	228,984	18,832,495
Water Heaters			
	Sept.	171,350	7,691,968
	Aug.	183,905	8,084,702

Most types of heating and cooking equipment showed similar increases.

Southern Merger Okayed

Proposed merger of Alabama Gas Co. and Birmingham Gas Co. (both of Birmingham) into the Alabama Gas Corp. has been okayed by the SEC. The companies are subsidiaries of the Southern Natural Gas Co.

Financial changes call for the issuance of notes by Birmingham to retire outstanding obligations of the two companies, an issuance of stock by Birmingham to Southern Natural for its holdings in Alabama Gas, and a Southern Natural offer to exchange to the public shareholders of Birmingham one share

of Southern Natural common for two shares of common.

Birmingham was recently party to a show cause hearing held by the Alabama Public Service Commission in connection with the temporary emergency service regulation which limits the use of gas as a heating fuel. The commission was ready to cancel the regulation, but after a presentation of data by the company, directed it to furnish gas for heating to a "limited number of applicants:" the first 1500 who applied after Dec. 13.

ConEd Seeks Exchange

Consolidated Edison Co. of New York is seeking authority to issue $28 million of convertible debentures to be used in its deal to take over Long Island Lighting Co. and two other utilities. The debentures will be offered in voluntary exchange for the proposed common stock of the consolidated Long Island Lighting Co. Long Island's reorganiaztion plan is still the key to the situation.

The offer will provide for the deposit of certificates for stock of the present Long Island Lighting, Queens Borough Gas and Electric, or Nassau and Suffolk Lighting, or for common stock of the consolidated Long Island Co. (see *GAS*, Nov., 1948, p. 80).

Accounting Shifts Made

The FPC has "approved" accounting adjustments by Cities Service Gas Co. of Oklahoma City, and Colorado-Wyoming Gas Co. of Denver. Cities Service is eliminating from its gas plant adjustments accounts $1,373,913.08 representing cost of certain leaseholds and profits on engineering fees paid to affiliates. Last January the FPC similary approved adjustments disposing of more than $16 million representing excess over original cost of the company's gas plant.

The FPC is allowing Colorado-Wyoming to dispose of $137,628.46 representing a reduction in the amount claimed by the company as the original cost of its gas plant as of Dec. 1, 1939.

Dresser Sale Underway

In its move to acquire three wholly-owned subsidiaries of Dresser Industries, Inc.—Bryant Heater Co., Cleveland; Day & Night Manufacturing Co., Monrovia, Calif.; and Payne Furnace Co., Beverly Hills, Calif.—Affiliated Gas Equipment Inc. of Cleveland has filed an SEC registration for public offering of 40,000 shares of $3 cumulative preferred $50 par stock and one million shares of $1 par common stock. Proceeds will be used for the purchase of the three firms.

Affiliated will obtain another $4 million through the sale of notes to insurance companies. One million dollars of this will be applied to the purchase of assets of the three companies, $1 million is slated for capital expenditures, and $2 million is set for working capital and general corporate purposes.

GAS PRODUCTION

Alberta Project

Plans for pipeline, highway told

Gas production and exploration in the Peace River district, which straddles the British Columbia-Alberta border, is still providing headlines for Canadian papers.

An official of the Peace River Natural Gas Co. Ltd. says that new wells are being brought in steadily at the 2500 ft level, and that plans for a $40 million pipeline to Vancouver, B.C., 600 miles away, are being projected. Construction of a highway from the Peace River district in southern British Columbia also is foreseen.

The Alberta minister of lands and mines has announced the personnel of the three-man commission to survey gas reserves in the province, in connection with Northwestern Natural's proposal to export gas to the Pacific Northwest (*GAS* December 1948), as R. J. Dinning, president of a meat-packing concern; Roy C. Marler, president of the Alberta Federation of Agriculture; and Andrew Stewart, professor of economics at the University of Alberta. The commission is to report on probable requirements of Alberta users and the marketing of surplus gas outside the province. Alberta banned the export of natural gas more than a year ago.

Proven reserves in Alberta have been estimated at 1431 billion cu ft, according to Dr. G. S. Hume, chief of the geological survey, federal resources department. He set probable reserves at 2286 billion cu ft.

Meanwhile, the city council of Medicine Hat, in southern Alberta, went on record as being opposed to the export of natural gas from the province. A milling concern manager told the council that to his knowledge gas pressure was not presently as strong as it was a few years back, and that it had become necessary for the city to go farther and farther away for its supply.

Flaring Battle

The Texas Railroad Commission is holding another show cause hearing Jan. 25, with operators in 26 more oil fields ordered to appear before it in connection with the commission's attempted mop-up of flaring. Meanwhile, oil operators have gained permanent injunctions in cases involving two of the 15 fields which the commission is attempting to shut down for alleged wasting of casinghead gas. Temporary injunctions have been granted in the other cases.

The 26 new pools include the huge East Texas pool; at the show cause hearing the commission will ask why the operators should not cease flaring gas estimated at 177 MMcf daily. Daily oil production in these fields has been set at 428 thousand bbl.

Since the commission's first order there's been a ding-dong battle in Texas courts, with possibly the major fight due Jan. 12 in Texas' supreme court. The first permanent injunction granted, blocking the commission's orders, affected Heyser field, in Calhoun and

Question:

Which car will they buy?

The housewife usually has the last word when buying decisions are made. This is especially true when she buys a new range. She wants her cooking made easier, and the gas industry will benefit by cooperating with her to this end.

WHAT WE WANT

The gas industry . . . utility, range manufacturer, dealer . . . wants her to continue to regard gas as the best fuel for cooking. This will be done only with improved ranges making gas perform better than other ways of cooking. Most important, gas ranges must have top burners providing all heats needed in cooking. Only a two-section burner with a Center Simmer can give accurate, *visual* control from 300 to 1200 Btu.

WHAT SHE WANTS

When the advantages of Harper Center Simmer Burners are explained, women invariably want them. They want the advantages of accurate *low heat* control in flavor-saving cooking with minimum water, boiling without boiling dry, cooking of thick liquids, pressure cooking and keeping food at serving temperature without over-cooking.

WHAT SHE FINDS

The housewife finds that ranges equipped with Harper Center Simmer Burners give superior performance. She has lower gas bills, her kitchen is cooler, she saves in cooking time and pot watching, her meals are tastier and more healthful. Ask any of the more than two million women *using* gas ranges equipped with Harper Center Simmer Burners. Surveys show they will *always* cook with gas!

QUESTION: The *performance* of the gas ranges in use will determine the extent to which gas is used for cooking in the future. Why not, then, equip *all* new gas ranges with Harper Center Simmer Burners?

"HOLDS THE LINES FOR GAS"

HARPER CENTER SIMMER

HARPER-WYMAN COMPANY

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Victoria counties. This case was appealed directly to the supreme court, but operators obtained a postponement until the January date in order to prepare briefs. The commission's appeal was made on the basis that only questions of law are involved in the case, and that the validity of the original order is the only question before the court.

The second permanent injunction was granted to operators in Flour Bluff field. Attorneys for the state have appealed this case to the Third District Court of Appeals.

Commission Chairman Ernest O. Thompson, in a comment on the latest commission shut-down order, said that the present above-ground storage of oil precludes any danger of an oil shortage this winter. "This position of over supply offers a splendid opportunity to stop wasteful flaring . . . without jeopardizing oil supply in the least."

Chiming in with Thompson was D. Harold Byrd, president of the Independent Petroleum Association of Texas, who said that independent producers were disturbed over the litigation brought by the oil companies in the effort to derail the commission's orders. "Operating a well to get the oil out of it, then burning the gas that comes up with the oil, is a betrayal of a trust,," he said.

Final quote on the subject is from Texas' attorney general, Price Daniel, who has said, "If we had evidence of thousands of barrels of oil being poured on the ground and burned, would anyone say the railroad commission was unreasonable in stopping such burning immediately?"

Oklahoma Discovery Well

A discovery well which flowed at the rate of 2910 Mcf and 164 barrels of 63-gravity condensate daily has been brought in in Beckham county, Oklahoma. The well is located on an 8000-acre tract shared jointly by the Union Producing Co., a subsidiary of United Gas Corp., and Westoak Gasoline Co., a subsidiary of United Carbon Co. The tract takes up sections of both Beckham and Washita counties.

About one mile north of the new well—called Music No. 1—a second well is being drilled, while a third is going in a mile southwest of the discovery well. The two companies have stated that at least a year will elapse before any income can be obtained from the new wells, and that "additional drilling will be required before any determination can be made of the extent of the producing area or of the reserves of oil and gas underlying the properties."

Propane Facilities Planned

Southern Indiana Gas & Electric Co. is planning propane facilities to augment its supplies during peak periods. The company wants to build a $175,000 plant at Evansville, Ind., and has petitioned the Indiana public service commission for an increase of five cents per Mcf to 32,000 customers in the Evansville area.

Last winter, due to a pressure drop in Texas Gas Transmission Corp.'s lines, 16,251 persons were thrown out of work, 817,000 man-hours being lost over an 18-day period.

REGULATION

Milwaukee Conversion

SEC approval of a group of bank loans totaling $4.5 million will allow the Milwaukee Gas Light Co. to make its scheduled changeover from manufactured to natural gas, a part of the developments stemming from the Michigan - Wisconsin Pipe Line Co.'s Texas-to-Michigan pipeline project. The two companies are associates.

The pipeline project was first authorized by the FPC in 1946, and included 1069 miles of 22- and 26-in. pipe from Texas' Hansford county to the Austin storage field near Big Rapids, Mich.

In a new, joint application, Michigan-Wisconsin, Michigan Consolidated Gas Co., and Austin Field Pipe Line Co. (all of Detroit) have asked permission to increase the line's capacity by 28 billion cu ft a year through the installation of additional compressor units which would boost the compressor hp 32,400 to a total of 48,000 hp. Authorized capacity now is around 47 billion cu ft.

The companies also propose to reroute one section of the main line and substitute 24-in. pipe for the 26-in. pipe previously authorized between Hugoton field and the "Wisconsin Junction." Michigan-Wisconsin proposes to furnish Michigan Consolidated with supplies in excess of those now supplied by Panhandle Eastern Pipe Line Co.

The additional facilities will make the overall cost of the project about $88 million. Cost of the facilities to be constructed by Michigan Consolidated and Austin will run about $400,000 and $3 million, respectively.

Cities Ask for Natural

Three Michigan cities—Port Huron, Marysville, and St. Clair—have asked the FPC to direct Panhandle Eastern to connect its facilities with those of the Detroit Edison Co. Their area, according to the petition, is the only large area in southern Michigan not served with natural gas. The petition spoke of "prohibitive rates" and shortages and curtailments of their manufactured gas supply.

Inch Gas Demand High

A lot of companies are eager to get some of the available gas coming from Texas Eastern Transmission Corp.'s expansion of the Big Inch, but so far the FPC has denied all bids, with the Consolidated Companies (East Ohio Gas Co., New York State Natural Gas Corp., and Peoples Natural Gas Co.) getting all gas over Texas Eastern's authorized 433 MMcf daily. Texas Eastern has a temporary authorization to increase its delivery capacity by 75 MMcf daily.

Eleven Ohio communities and the city of Cleveland were the first to file notices of intervention, the FPC rejecting the notices as "too late." The notices were not filed 10 days prior to the date of hearing.

The FPC said no to two Pennsylvania communities and the Independent Natural Gas Association of America a few days later, in early December, and followed the same path Dec. 10 by denying petitions submitted by Rochester and Syracuse, N. Y., and 12 other New York and Pennsylvania communities.

In between denying petitions, the FPC further modified its authorization for Texas Eastern to sell its excess to the Consolidated Companies by allowing it to sell excess to the Texas Gas Transmission Co. This authorization followed the explosion Nov. 19 at Seymour, Ind., which restricted delivery of Texas Eastern gas to the Consolidated Companies.

Oral argument on the 75 MMcf boost of the Big Inch began Dec. 16.

New Rates for NoNatural

Northern Natural Gas Co.'s recent increase in pipeline capacity—35 MMcf, of which 27 MMcf will go to customers—has brought forth revised rate schedule provisions for apportionments from the FPC. The provisions became effective Nov. 27.

The revisions apportion additional capacity to customers in three steps:

1) For residential non-space-heating purposes a volume equal to 10 cu ft of demand per customer for each year since the last allocation.

2) Specific volume for non-space-heating requirements of residential and small-volume commercial and industrial consumers will be assigned in communities changing over to straight natural gas.

3) Of the remaining gas, 50% to be allocated on the basis of the number of residential consumers of each community without house-heating, and the other half on the basis of contract demands as of last Sept. 1.

The order stems from complaints originating from Northern Natural's two previous allocation proposals, filed March 3 and June 9: on the basis of the number of customers without gas house-heating, and on the basis of the number of consumer meters.

Carrier Rule Upheld

A common carrier ruling on shipping charges made by the Montana-Dakota Utilities Co. has been upheld by the Supreme Court. The case started when a shipper complained that M.-D. was making unreasonable and discriminating charges for transportation of gas in one of its lines. The FPC investigated, then prescribed a rate schedule covering the company's entire system.

The 8th circuit court of appeals affirmed the FPC's decision ordering a system-wide rate for common carrier transportation, and the highest court has declined to review the case. The FPC order also provided that equal service be rendered to all shippers using the utility's common carrier facilities.

New Safety Law Seen

A new state law controlling the piping, appliance installation, and inspection and maintenance of natural gas and LP-Gas installations for Texas schools may evolve from

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—*with* GARLAND!

MODERNIZE with the *new line* that has important new features for convenience, speed, flexibility, and sanitation.

HARMONIZE with matching units that not only look efficient but *are* efficient.

ECONOMIZE by getting more for your original investment in commercial cooking equipment—by getting equipment that saves gas, and lets your chef serve better food and more meals with no more effort.

Compare everywhere! You'll find Garland leads in sales because Garland leads in value! All Garland units are available in stainless steel or black japan finish and are equipped for manufactured, natural or L-P gases. See your nearest dealer.

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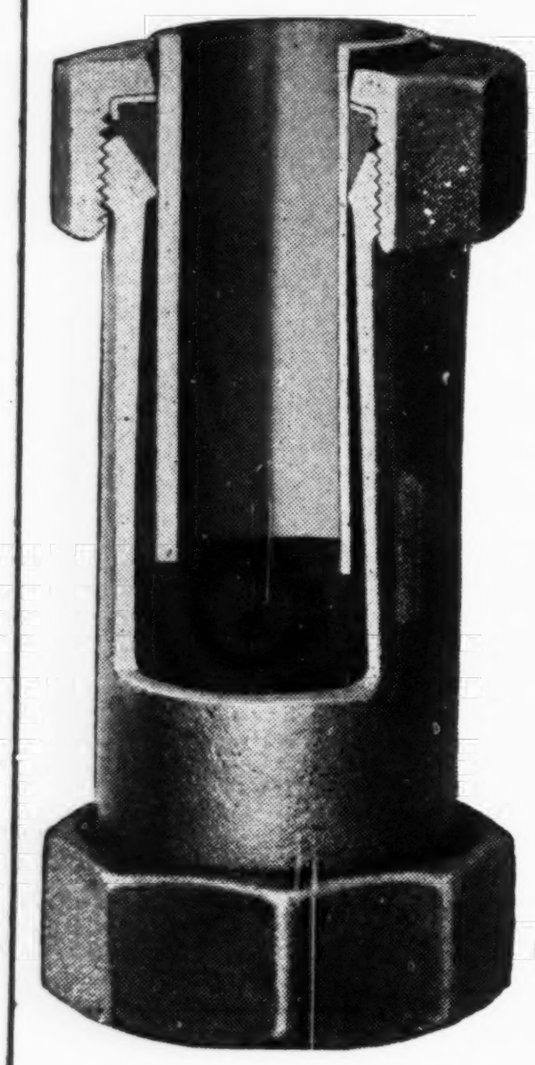
COUPLINGS, SLEEVES and FITTINGS

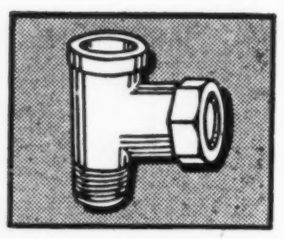


for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

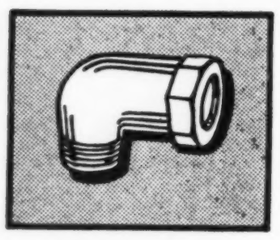
NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

COMPRESSION-END SERVICE "TEE"



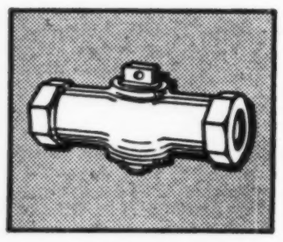
First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.

COMPRESSION-END SERVICE "ELL"



Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.

COMPRESSION-END IRON BODY BRASS CORE SERVICE STOPCOCKS



End the necessity of threading on the job plus the elimination of the threads themselves — combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

NORMAC BRASS FITTINGS DEVELOPED IN 1939 FOR USE WITH COPPER TUBING

Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

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Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

the work of a new Gas Regulation Safety Conference for Texas Public Schools. The first conference saw the appointments of two committees: Piping and Venting, and Central Heating Plants and Forced Air Units. Committee members from Texas utilities include Feild Foster, Lone Star Gas Co., Dallas (chairman of the Piping and Venting group); I. W. Wilke, Texas Public Service Co., Austin; and L. B. Denning Jr., of Lone Star.

TETCO Hearing Set

The hearing concerning supplemental rate schedules proposed by Texas Eastern Transmission Corp. has been postponed again by the FPC, this time to March 14. Texas Eastern seeks an increase in rates and charges under tax adjustment clauses in its agreements—and Louisiana has put a new tax on gas produced in that state.

The company's proposed schedules were suspended previously by the FPC until Jan. 13. Texas Eastern has agreed, however, that if the new postponement is granted it will not move to put the schedules into effect before a final determination is made by the FPC.

Winter Rules Unchanged

The Illinois Power Co., Decatur, Ill., has found that the winter emergency service rules are in again—solidly—for Panhandle Eastern. The Illinois company applied for a rehearing in an effort to obtain more gas, but the FPC said that the company's petition "does not state any reason or good cause . . . for reopening the (Oct. 21) proceedings or granting rehearing."

Panhandle and the companies dependent upon it for their gas supply were given opportunity at the October show cause hearing to object to the re-inforcement of winter rules, but no objections were made.

Draper Elected

Claude L. Draper has been elected vice-chairman of the FPC for 1949. Commissioner Draper has been a member of the FPC since 1930. He succeeds Harrington Wimberly.

MISCELLANY

Repairman's Heaven

Civic leaders reward hard work

Bartlesville, Okla., is obviously the repairman's heaven on earth. At least he knows his work there is appreciated. Late in October Bartlesville civic organizations and business men paid special tribute at a chamber of commerce luncheon to A. F. Potter, local manager for the Cities Service Gas Co., and his employees, for their quick and efficient work in restoring service to the town after the mainline into Bartlesville had broken. The mainline broke on a Saturday morning; by evening most customers were able

1ST

A. O. SMITH's new "2-for-1" co-op advertising plan is the <u>first</u> to take you into full partnership...with the most liberal co-op program ever offered the water heater industry.

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It's one more reason "*Permaglas*" is first . . . one more reason why you can make more money with "*Permaglas*" . . . the automatic water heater that needs no special attachments or accessories because its tank of glass-fused-to-steel *CANNOT* rust. Get the facts . . . use the coupon . . . now.

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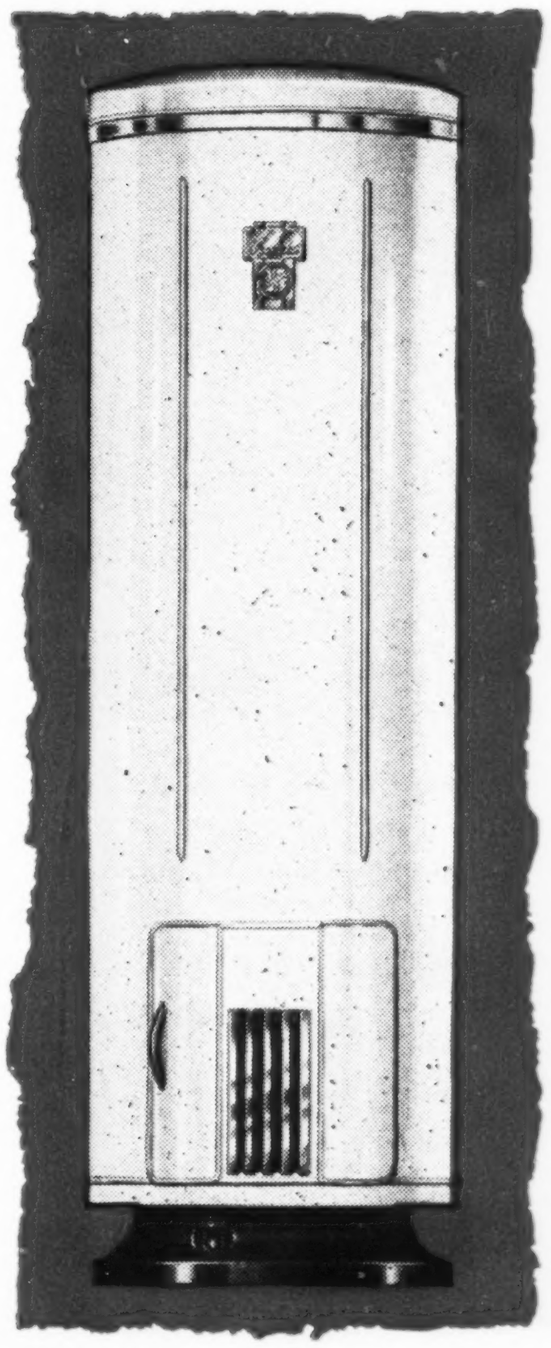

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W. M. LITTLE
General Superintendent
Gas Distribution
Arkansas Louisiana
Gas Company

"We needed a machine that would dig a narrow ditch, be light weight, and easy to transfer from job to job"

Among other factual statements of performance of the Longhorn Mobile Ditcher, Mr. Little said this in a recent letter: "We have been using one of these machines in the construction of gas distribution mains and services. The operating cost of the machine is approximately 2.5 cents per foot, and the maintenance cost is approximately 1.7 cents per foot, giving us an overall trenching cost of 4.2 cents per foot, not including depreciation. The machine moves from job to job under its own power on rubber-tired wheels at a rate of 10 to 15 miles per hour. We think it is a machine that fills a need in the distribution operations."

Longhorn Mobile Ditcher

on the job for Arkansas Louisiana Gas Company

These action photographs show a Longhorn Mobile Ditcher digging trench 40" in depth at a rate of 7 linear feet per minute. The Arkansas Louisiana Gas Company owns 3 Longhorn Mobile Ditchers.

Telephone, Wire, or Write for Complete Information

Longhorn Industries, Inc.

Henderson, Texas **Phone 1035**

to cook their dinners, and all but a few homes had their services restored by midnight.

Same Old Story

It's terrible to have to turn away business, but in common with a lot of other gas companies Philadelphia Gas Works Co. and the Philadelphia Electric Co. system have taken on all the gas home heating customers they can supply this winter. The former company has almost 50,000 customers now, with 25-50,000 more on its waiting lists. Come spring, both companies will take a long look at existing demand, the amount of natural gas available from the southwest, and the amount of expansion capital available, with an eye to getting set for more expansion. Philly Gas went up to 200 MMcf on peak days last winter; this year's estimates are 220-240 MMcf daily.

Cadet Program Expanded

The cadet engineering program of the Pittsburgh Group of the Columbia Gas System, Inc. recently has been expanded. Paul M. Allen Jr. has been appointed district engineer for the northern portion of the Manufacturer's Light and Heat Co., distribution district No. 5, while James F. Baechtel has been named district engineer for the Cumberland and Allegheny Gas Co.

The cadet engineering program was initiated in 1947. According to G. E. Wilson, distribution superintendent for the Pittsburgh Group, it has met all expectations in helping to improve service in the five-state area served by the group.

Employees Get the Word

Another good employee relations idea has been instituted at Southern California Gas Co. In order to maintain a better flow of information from management to employees on subjects of common interest, occasional separate sheet inserts will be included when the employee publication, *Gas News,* is distributed.

The first of these dealt with SoCal's disability benefit plan; others will follow "only when there seems to be a need for facts, information, or an interpretation of facts you (the employees) already know," according to F. S. Wade, president of SoCal.

Teaching the Public Early

The AGA and Brooklyn Union Gas Co. have cooperated on a silent strip film "How We Get Our Gas," designed for use as a teaching supplement in elementary schools. The film will be offered to gas companies for use in their territories, and is accompanied by a teacher's guide.

Scenes covered in the film include: how coal is converted into gas, the manufacture of carbureted water gas from coke, the process of drilling, piping, and transmitting natural gas, and the piping and distribution of gas to customers.

PEOPLE

L. A. DIXON JR., assistant general manager of the Pittsburgh DuBois division of Rockwell Manufacturing Co., recently was named general manager of the division. Mr. Dixon announced that an expansion program is planned to accelerate production of tin meters which constitutes the major part of the DuBois division's operations. In 1944 Mr. Dixon became executive vice president of Pittsburgh-DuBois, and when Rockwell acquired that company in 1947 he was named assistant general manager.

L. A. Dixon

ARTHUR W. KRAUSE and ALVIN M. CUNNINGHAM recently were added to the engineering division of The Gas Machinery Co., Cleveland, Ohio. A licensed chemical engineer, Mr. Krause had served as research engineer with the AGA Testing Laboratories in Cleveland. He was formerly employed by Shell Development Corp., at Emeryville, Calif. Mr. Cunningham worked for the Pittsburgh division of the Pennsylvania Railroad Co. and then for the AGA Laboratories.

JAMES E. COLEMAN has been named purchasing agent for The Manufacturers Light & Heat Co. and its associated gas companies in the Pittsburgh Group of The Columbia Gas System Inc. Mr. Coleman, who had served as assistant purchasing agent since July, joined Manufacturers in 1937 as an industrial engineer. He entered the gas industry in 1925 when he was associated with Northern Indiana Public Service Co.

F. M. PARTRIDGE of Southern California Gas Co.'s engineering service staff was appointed to the new position of gas measurement engineer on Nov. 1. Mr. Partridge will coordinate the activities of all divisions involved in large volume gas measurement and will assist with special measurement and instrument problems.

CHARLES H. COOMBS has been named New York district manager for Motorola Inc. He will work with ALLAN WILLIAMS, regional manager in the east. Mr. Coombs formerly was connected with Radio Corp. of America as eastern sales manager.

R. O. Luqueer

ROBERT O. LUQUEER, who has been an officer and director of Norwalk Valve Co. since 1944, has assumed responsibility for the company's national sales. A graduate of Stevens Institute of Technology, Mr. Luqueer has been connected with the gas industry for many years. He was associated with the Consolidated Edison Co. of New York, Buffalo Gas Co., and several gas engineering firms.

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BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

ROBERT H. TAYLOR was elected president of Florence Stove Co. to fill the vacancy caused by the death of Edward F. Dobson. Mr. Taylor, who has been vice president in charge of sales and a director of the company, joined the organization in 1932. He has served in a number of credit, sales, and managerial positions.

E. P. HENNEK, general superintendent of Central Electric & Gas Co., Lincoln, Nebr., took over Dec. 15 as executive vice president of the Western Light & Telephone Co. of Kansas City, Kan. Four changes at Central Electric & Gas were occasioned by Mr. Hennek's resignation. E. E. BAXTER, commercial manager, became general superintendent. LOUIS LANGHUS, plant superintendent, is now general plant superintendent, and he named HAROLD STANTON to assist him. Mr. Stanton's title is plant superintendent, gas department. Mr. Langhus appointed L. E. DADE as plant superintendent, Lincoln district.

LEE VAN HORN has been appointed chief process engineer for Fluor Corp. Ltd. His headquarters will be in Los Angeles. Mr. Van Horn has been connected with the development of refining processes for the past 20 years. HAROLD GEARIN has joined the company's sales staff. He will soon become sales coordinator among the company's various district offices.

AL EHRKE heads the new Cleveland sales office of A. E. Ehrke & Co., recently appointed as district sales representative for Fisher Governor Co. of Marshalltown, Iowa. The Ehrke organization replaces Tomlinson Steam Specialty Co. Mr. Ehrke has been in the sales engineering department of Fisher's home office for 10 years. BILL SIXT and F. L. ZEHE, formerly of the Tomlinson Co., are associated with the Ehrke firm.

HENRY A. DIEKMANN, assistant to the manager of Brooklyn Union Gas Co.'s new business department, has been promoted to assistant manager. Mr. Diekmann held positions as floor salesman, district representative, district house heating supervisor, coordinator, supervisor of the house heating group, and finally assistant to manager before his present assignment.

HARRY R. LEHMAN has been appointed factory manager for Cribben & Sexton Co., Chicago, and JOSEPH A. NAGELBERG has been named purchasing agent. Mr. Lehman has been engaged in plant supervisory work for the past 21 years, most of the time as general superintendent of J. I. Case plants.

H. R. Lehman

J. A. Nagelberg

Recently he was vice president in charge of production for Adel Precision Products Corp. of Burbank, Calif. Mr. Nagelberg has been associated with the company since 1942 and has served as assistant superintendent of maintenance, assistant purchasing agent, and purchasing agent.

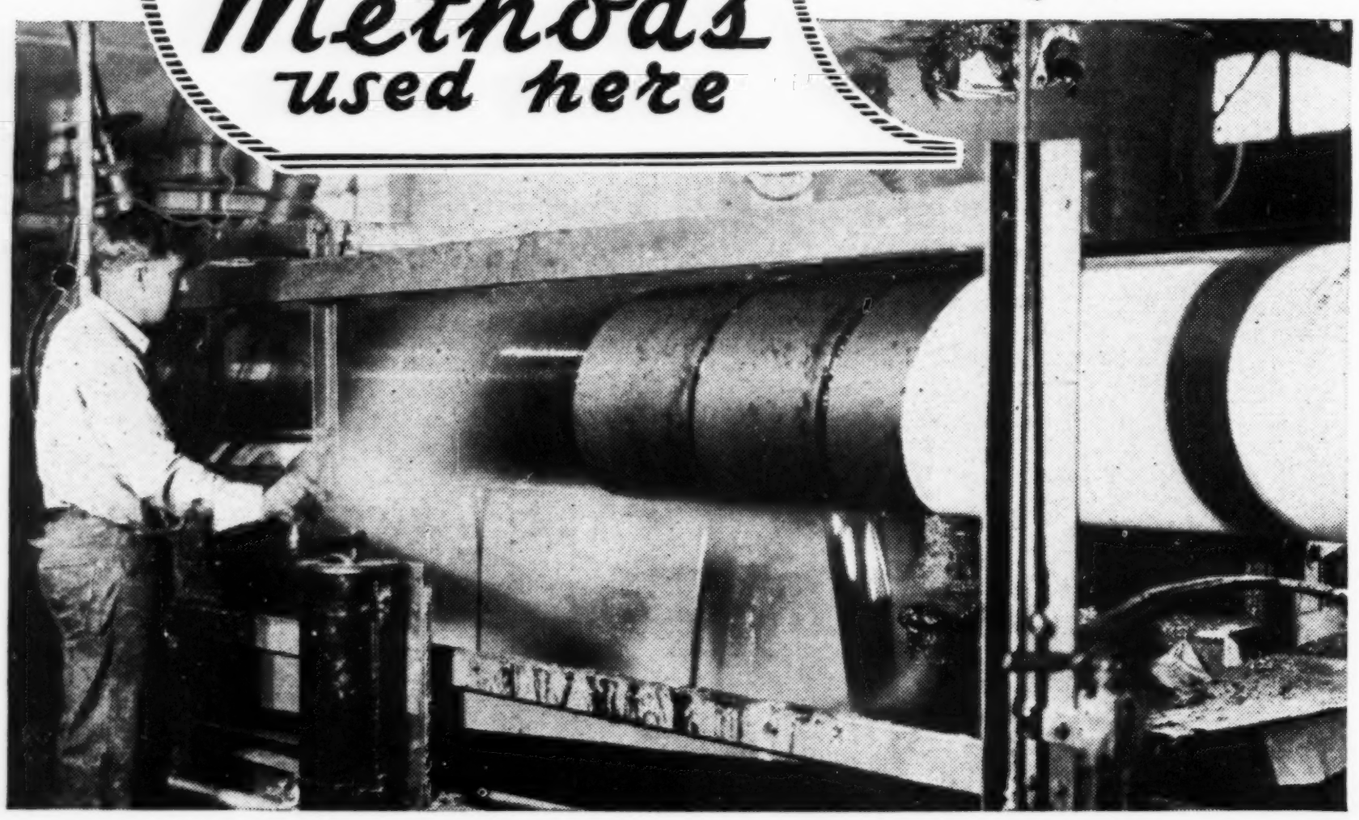
ROY E. MANNING, former national sales manager for the Pittsburg Water Heater Co., has purchased the E. A. Bibey Co. of Pittsburgh, Pa. The Bibey company manufactures water heater coils and repair parts. Mr. Manning will also act as distributor for the Clayton & Lambert Co. and will distribute other plumbing and heating specialties throughout three states.

ALFRED P. RAMSEY, assistant general counsel for the Consolidated Gas Electric Light & Power Co. of Baltimore since 1927, has been appointed general counsel of the utility. Mr. Ramsey fills the vacancy created by the death of EDWIN M. STURTEVANT, general counsel since 1927. Mr. Sturtevant, who was 61, died in November after a short illness.

NAT R. WOOSLEY has replaced TOM J. COMPTON as district manager of the Prescott (Ark.) district of Arkansas Louisiana Gas Co. Mr. Prescott was recently promoted to special representative of the entire Arkansas division. Mr. Woosley has been associated with ALGC for 19 years.

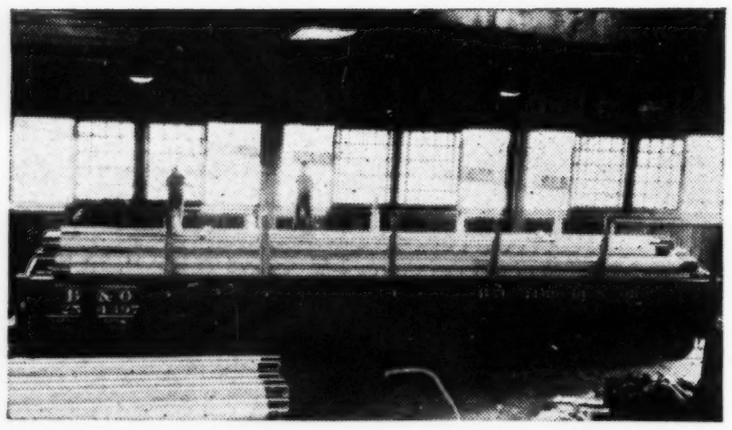
No Uncertain PIPE PROTECTION Methods used here

HILL HUBBELL PIPE PROTECTION



HILL, HUBBELL FACTORY METHODS are Modern...

New progressive methods of coating and wrapping steel pipe at the HILL, HUBBELL plants, enable YOU to recieve your processed pipe on pre-arranged schedule.



Rain, snow, dust, fog, extreme heat or cold, are hazards that have caused serious damage to many field-coated jobs. With the HILL, HUBBELL process all operations, even to the loading of cars, are done indoors.

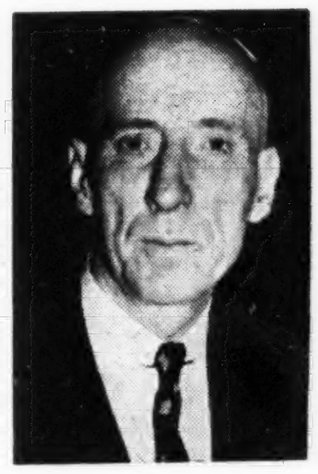
Our name is on our work—*YOUR* assurance of *MAXIMUM* pipe protection.

PROGRESSIVE ADVANCEMENT YESTERDAY TODAY and TOMORROW

Hill, Hubbell and Company
Division of GENERAL PAINT CORPORATION
3091 MAYFIELD RD. CLEVELAND, OHIO.

C. S. Coates
. . . TGT

Max W. Ball
. . . Interior Dept.



C. B. Johnson

E. R. Gilmore
. . . Pittsburgh Equitable

R. E. Fisher
. . . PG&E

R. W. Galvin
. . . Motorola

CHARLES S. COATES, general superintendent of operations and construction for Tennessee Gas Transmission Co., has been made a vice president by the company's board of directors. Mr. Coates joined TGT as assistant to the president in 1943. He had previously been connected with The Chicago Corp. and Richardson Petroleum Co., Corpus Christi.

MAX W. BALL, director of the Oil & Gas Division, U. S. Department of the Interior, since December 1946, resigned Dec. 1 and returned to private consulting practice in Washington, D. C. During the war Mr. Ball was special assistant to the deputy administrator of the Petroleum Administration for War. He has held numerous government positions, including chairmanship of the U. S. Geological Survey oil board.

C. B. JOHNSON has been named chief engineer and E. R. GILMORE director of research for the Pittsburgh Equitable Meter Division, Rockwell Manufacturing Co. Mr. Johnson became product engineer for Pittsburgh Equitable in 1929, chief engineer for the Pittsburgh-DuBois Co. in 1941, and in 1944 returned to Rockwell as chief engineer of the Nordstrom Valve Division. Mr. Gilmore joined the firm in 1936 and has served as chief engineer of the meter and regulator divisions.

W. REED MORRIS, vice president and general manager of the gas and coke division of Koppers Co. Inc., has been appointed eastern representative for the entire Koppers organization. Mr. Morris will continue his duties with the gas and coke division and will be the company's chief administrative officer in the New York-New Jersey area.

R. E. FISHER, who retired from Pacific Gas & Electric Co. in 1947, is in Italy directing the rehabilitation, expansion, and modernization of that country's electric power facilities. Mr. Fisher was associated with PG&E for 36 years, the last 25 as vice president in charge of public relations and sales.

ROBERT W. GALVIN, 26, recently was appointed to the post of executive vice president of Motorola Inc. The announcement was made by his father, PAUL V. GALVIN, president of the company. For the past 2½ years Robert Galvin has served as assistant to ELMER WAVERING, vice president in charge of Motorola's auto radio division.

WALTER H. STELLNER has been named vice president of merchandising, and Mr. Wavering's new title is vice president in charge of automotive product design.

WARDEN AUTOMATIC LOW-PRESSURE SHUT-OFF VALVES

For Commercial and Industrial Users of Gas

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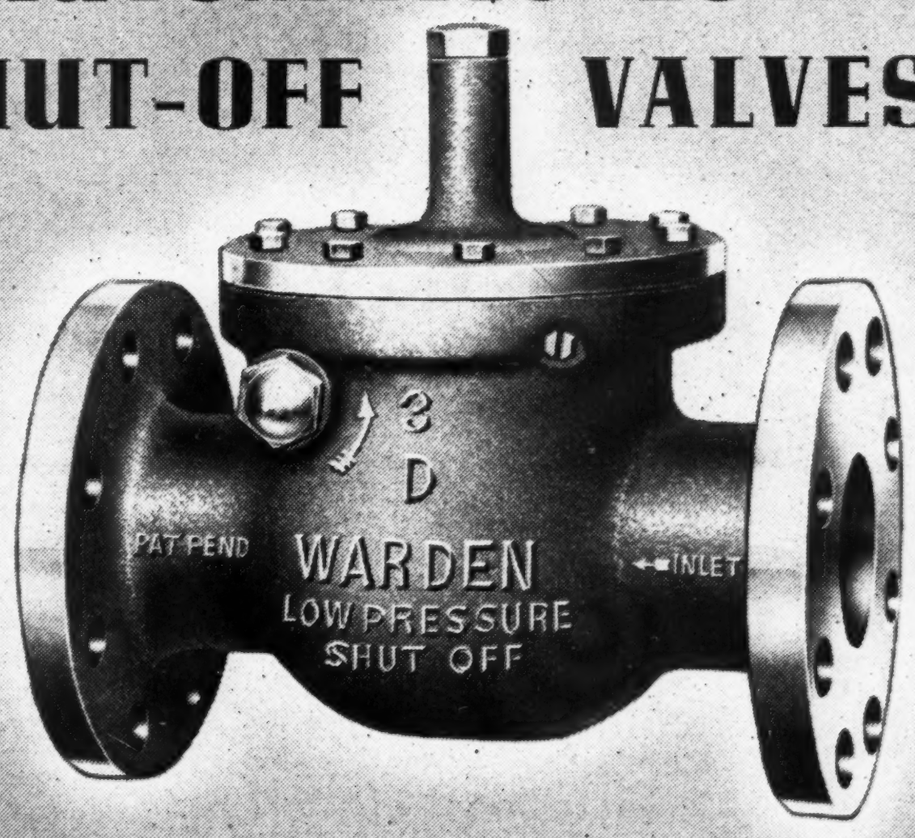
For use on Gas Company Distribution Lines



Models available for either high or low pressure application. Write for comprehensive bulletin containing complete engineering information

POSITIVE SHUT-OFF

FULL-FLOW DESIGN

Warden Shut-Off Valves provide absolute shut-off of fuel when the supply pressure fails *due to any cause.* The closure is positive. It will not leak or seep . . . will not re-open when the pressure returns . . . valve must be reset *manually* after the pressure is restored.

Manufactured by.. **SECURITY VALVE COMPANY** *A California Corporation*

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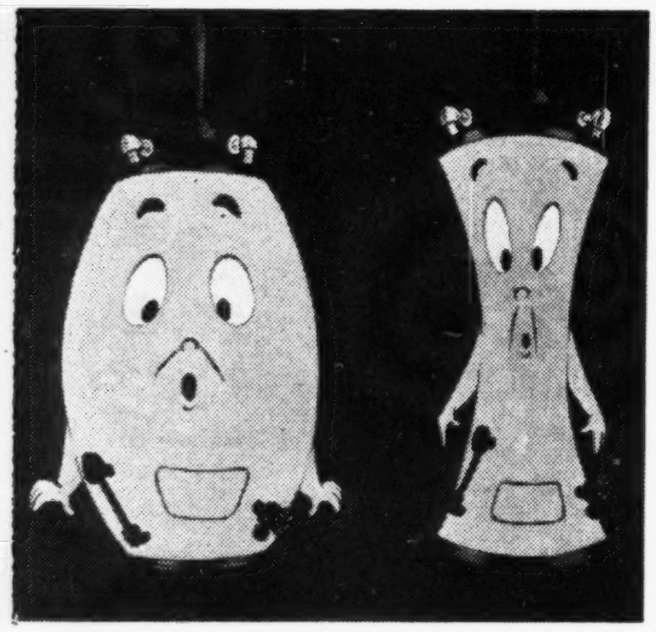
- OBITUARIES -

VIOLET B. BOYLE, first member of the home service department of The Gas Service Co., Kansas City, died Nov. 11 after a brief illness. After working many years for The Gas Service Co., Miss Boyle became home service director of the former Wyandotte County Gas Co. of Kansas City. In 1944 she joined the WAC and two years later rejoined The Gas Service Co. at Independence, Mo. For the past year Miss Boyle was employed as home service director of the Public Service Co. of Northern Illinois at Ottawa and the Illinois Power Co. at Galesburg.

G. GORDON BROWNELL, tax official of Cities Service Co., died suddenly on Nov. 30 at his home in Westfield, N. J. He was 64 years old. Mr. Brownell held various positions with the Denver Gas & Electric Co. from 1904 to 1910 when he joined Cities Service as manager of the accounting department. In 1917 he was appointed manager of the tax department and served in that capacity until his death.

SALES SLANTS

WITHIN A FEW months Servel refrigerators will have been installed in 1500 homes at Altgeld Gardens, housing project on Chicago's south side. About 1000 units have been installed and connected, and the rest will be delivered early in 1949. The refrigerators were sold by the apartment house section of Servel's domestic sales department.



EXPANSION AND contraction wear out under-sized water heaters, as pictured here in a scene from the 15-min sound slide film just released by the Pacific Coast Gas Assn. The full color film, including record, is being made available to the industry as a sales tool for the promotion of properly sized gas water heaters. Entertaining and educational for both trade and consumer groups, copies may be obtained through the association's San Francisco office at 447 Sutter St.

THE BENDIX automatic washer and dryer are featured in a new series of Hollywood-produced spot movies. Each film is a dramatic episode playing up the advantages of using Bendix laundry equipment. Expense of showings is borne cooperatively by the dealer, his distributor, and Bendix Home Appliances Inc. Dealers select 13 films and schedule them over a six-month period. Production was supervised by Stewart Roberts, advertising and sales promotion director for the company.

RHEEM MANUFACTURING CO. has been awarded a patent on its unique method of assembling zinc coated containers after galvanizing, a procedure which governs the company's entire mechanized process of tank manufacture. Other patents applied for refer to the complete system of automatic conveyorized galvanizing developed by Rheem, including acid baths and washes, galvanizing in the kettle, and detailed phases of these processes. The patent was granted to A. J. Lampert, Rheem engineer.

AMERICAN-STANDARD announced in December that it was returning to a firm policy in the sale of heating equipment and plumbing fixtures. The company began accepting orders from its wholesale distributors at prices prevailing at date of order. In establishing firm prices, President Theodore Mueller said, the company believes that heating and plumbing wholesalers and retailers will be able to render fixed price quotations on the company's products, and consumers can then budget their heating and plumbing costs more accurately.

FEATURED IN the all-gas kitchen of the Lanai House in Pacific Palisades, Los Angeles, Calif., is a Western Holly six-burner gas range. This luxurious range has two ovens, two pull-out broilers and automatic clock control. Generous food storage is provided by an 8-ft deluxe Servel refrigerator, and a 40-gal Superbo water heater gives a plentiful supply of hot water. Warmth throughout the house is provided by a Hammel gas furnace. Palisades Builders designed and built the home, which recently was opened for inspection.

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STREET CITY ZONE STATE

NEW PRODUCTS

Zinc Chromate Coating

PITTSBURGH EQUITABLE METER DIVISION, Rockwell Manufacturing Co., 400 N. Lexington Ave., Pittsburgh 8.

MODEL: Rust protective prime coating.

DESCRIPTION: Emco tin gas meter cases are being given a prime coating of zinc chromate as a rust preventative when customers specify it. The process was developed during the war and is now considered the best primer obtainable for metals subject to corrosive atmosphere.

The coating is applied by an electrostatic process sealing off the pores of tinned surfaces. The process permits the application of a heavier coat of zinc chromate than can be obtained by standard spraying procedures, and a more even coat of paint results, improving product appearance.

Pipe Mending Cement

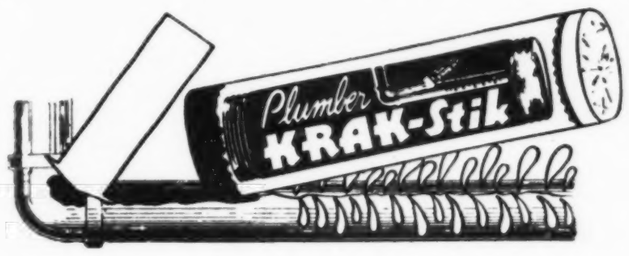
LAKE CHEMICAL CO., 162 N. Clinton St., Chicago.

MODEL: Krak-Stik.

APPLICATION: A positive seal for repairing split soil pipes, sandholes, cracked pipes, gaskets, or even pinholes.

DESCRIPTION: Plumber Krak-Stik stops

leaks instantly, the manufacturer says, even while liquid runs through the pipes under pressure or remains in the container. It assures a seal for gas, water, acids or brine. Pipe surfaces do not have to be prepared for



application of the cement. The stick is simply rubbed heavily over any crack or leak in pipes, vats, and other liquid containers.

Krak-Stik is also an excellent caulking compound.

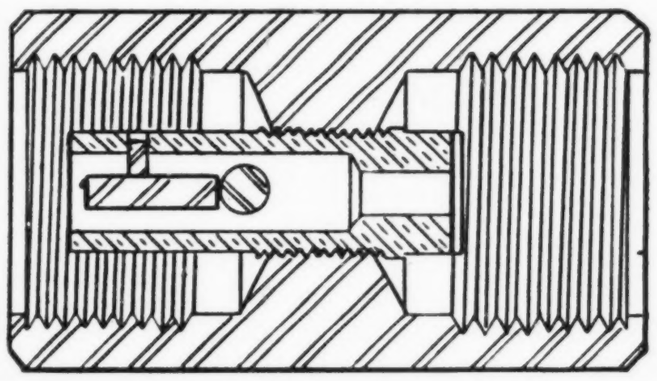
Automatic Shutoff

ERNEST C. LUNDT INC., Little Falls, N.J.

MODEL: Gas-phuse.

APPLICATION: To protect the high-pressure gas service user from hazards of broken pipes, regulators, or shutoff cocks and melted meters.

DESCRIPTION: Installation is to be made in the gas service line outside the building to be protected. Any rupture of pipe, meter, or regulator, causing a flow of gas in excess



of the amount for which the Gas-phuse is set, will cause it to shut off the entire flow until the leak is corrected.

Operation is instantaneous. The Gas-phuse may be reset, cleaned, or removed from within the house through the service pipe. It is all metal, no diaphragms or springs are used, and there is only one moving part. Installation is not critical and set flows are affected approximately 10% by vertical up or vertical down positions although the horizontal run will be customary.

The device is furnished in its own fitting style body of cold rolled steel or it may be inserted into the gas service from the house and expanded into the pipe. Sizes and flows are provided according to demand, including LP-Gas cylinder pigtails and underground tank connections which now may be protected.

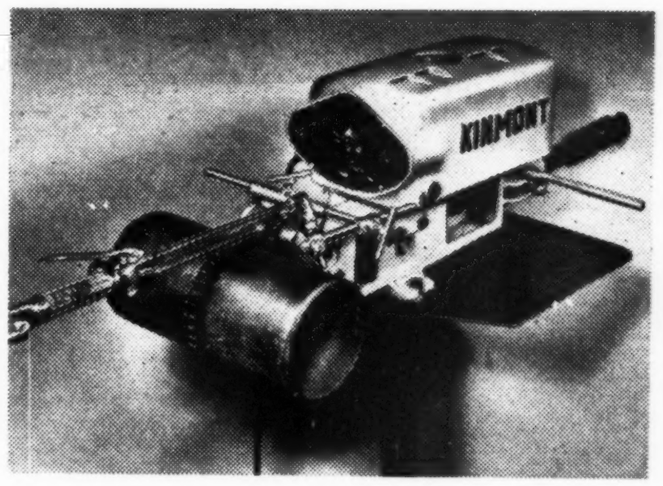
Cutting Torch Attachment

KINMONT MANUFACTURING CO. INC., 716 W. Wilson Ave., Glendale 3, Calif.

MODEL: Cutting torch attachment for Kinmont universal power unit.

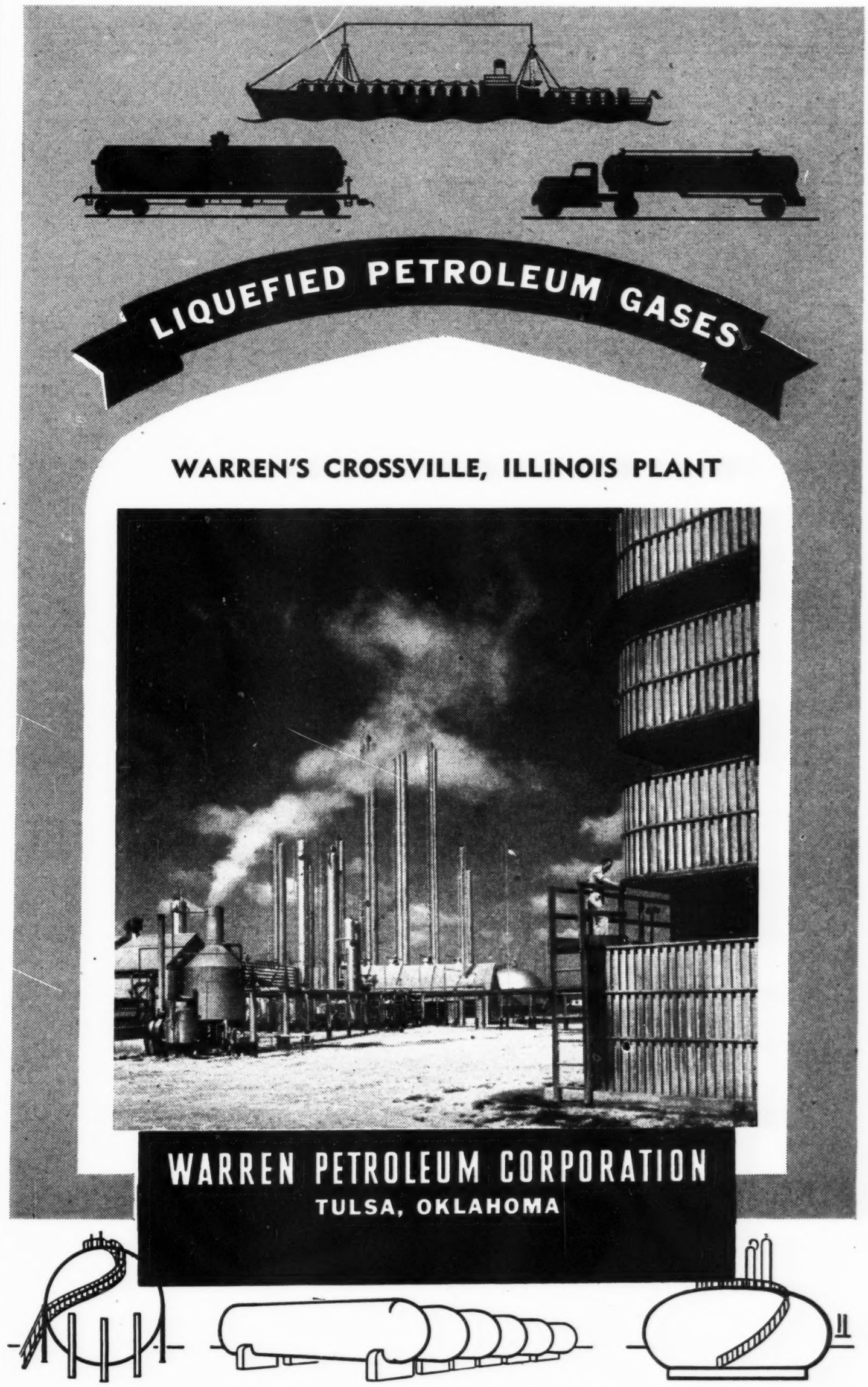
APPLICATION: For easy and fast adjustment of the cutting torch in handling a wide range of pipe sizes, and for maintaining a smooth bevel and a square cutoff across the end of the pipe.

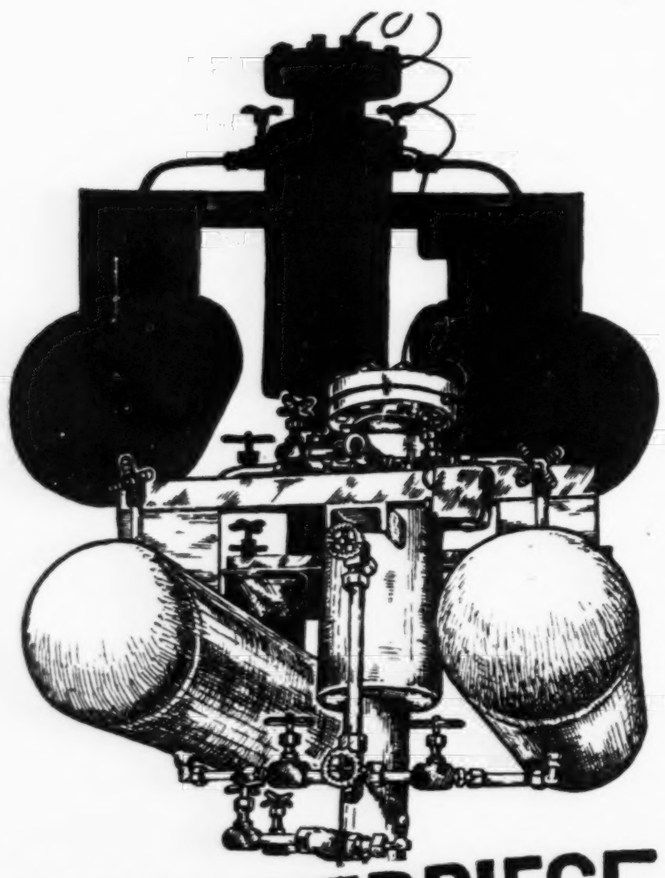
DESCRIPTION: The wide adjustment of the cutting torch attachment permits its use on any pipe size from 3 to 36 in. in diameter and on tanks up to 10 ft in diameter when turned on a roller rack. The turning speed of the power unit is controllable while



cutting operation is in progress, thus assuring a smoothly finished cut. A foot switch controlling the turning operation leaves the operator's hands free to control the torch and speed adjustments.

An important feature of the power unit, with the attachment, is the patented split link chain drive which permits rapid fastening and unfastening of the work being turned. The drive chain holds the pipe tightly locked in position and turning against fixed rollers on the power unit. This prevents creeping of the work, and enables the attachment-held cutting torch to produce a smooth, accurately beveled and square pipe end.





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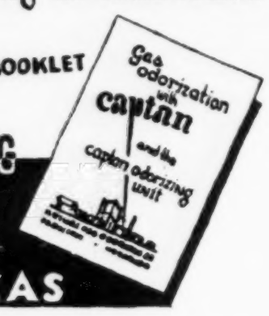

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With the demand for gas at an all time high, Iron Sponge answers the need for rapid flow and higher pressures in gas purification. Specify Iron Sponge for extra high capacity and activity . . . longer periods between necessary recoverings . . . fast, complete come-back after fouling . . . low initial cost and low maintenance . . . minimum operator attention. These are the advantages that have made Iron Sponge the choice of the gas industry for over 73 years.

Other Connelly products include:

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H2S TESTER. For quick, accurate tests using pre-tested paper discs.

CONNELLY Inc.

3154 S. California Ave., Chicago 8, Ill.
Elizabeth, N.J. • Los Angeles, California

Draft Control

SKUTTLE MANUFACTURING CO., 4099 Beaufait Ave., Detroit 7.

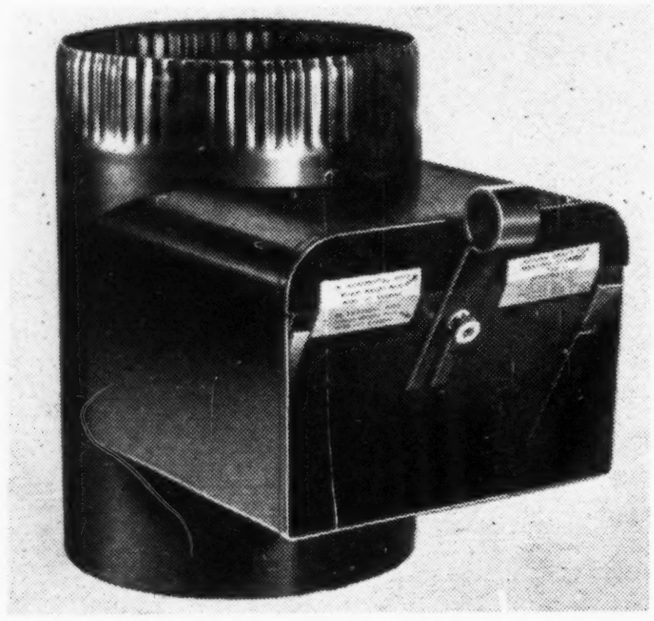
MODEL: Windmaster, type U.

APPLICATION: For draft control in horizontal or vertical flue pipe.

DESCRIPTION: The Windmaster features square or rectangular body construction with the vane mounted on an angle. This provides more intake area than a corresponding round opening, resulting in greater capacity.

The closed position of the vane is at an angle to the axis of the flue. This provides two advantages:

1. Larger effective area. Since the stack draft exerts an equal force on all portions of the vane, tending to move the vane toward



the stack, the effective area of the vane is the amount by which the area of the portion rotating toward the stack exceeds the area of that portion rotating away from the stack, as the vane opens.

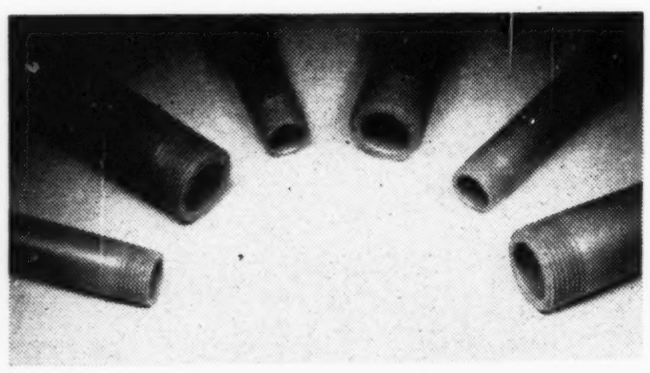
2. Smaller rotative arc. It is possible to balance a vane more effectively through this smaller angle in moving from the closed to the wide open position. The result is more accurate control of the draft through a wider range of draft fluctuations.

The shank of the counterweight is calibrated for horizontal installation on one side, for vertical on the other. When changing from horizontal to vertical it is only necessary to remove the adjusting nut and shift the counterweight from the horizontal to the vertical stud.

Plastic Pipe

EXTRUDERS INC., 8509 Higuera St., Culver City, Calif.

MODEL: Extrulite



APPLICATION: Developed to replace scarce metal pipe, Extrulite will handle water, natural or manufactured gas, organic solvents, alkalis, and other fluids.

DESCRIPTION: This lightweight plastic pipe will withstand working pressures up to 650 psi at temperatures to 100°F. It makes up with standard dies, tees, elbows, and joints, and 3½ ft of 1-in. pipe weighs only 1 lb. It is available in standard heavy wall pipe sizes from ⅛ in. to 3 in. ID.

Rechargeable Extinguisher

ANSUL CHEMICAL CO., Fire Extinguisher Division, Marinette, Wis.

MODEL: Emergency Fireman.

DESCRIPTION: This fire extinguisher contains 2 lb of Ansul "Plus-Fifty" dry chemical. It has been designed for effective use by inexperienced operators. It is rechargeable on the spot after use.

The dry chemical is non-toxic, a non-conductor of electricity, non-corrosive and non-abrasive. It will not deteriorate, solidify, or evaporate and therefore does not require periodic recharging.

The fill cap is built into the mounting bracket. This makes the extinguisher ready for instant use the moment it is removed from the mounting bracket.

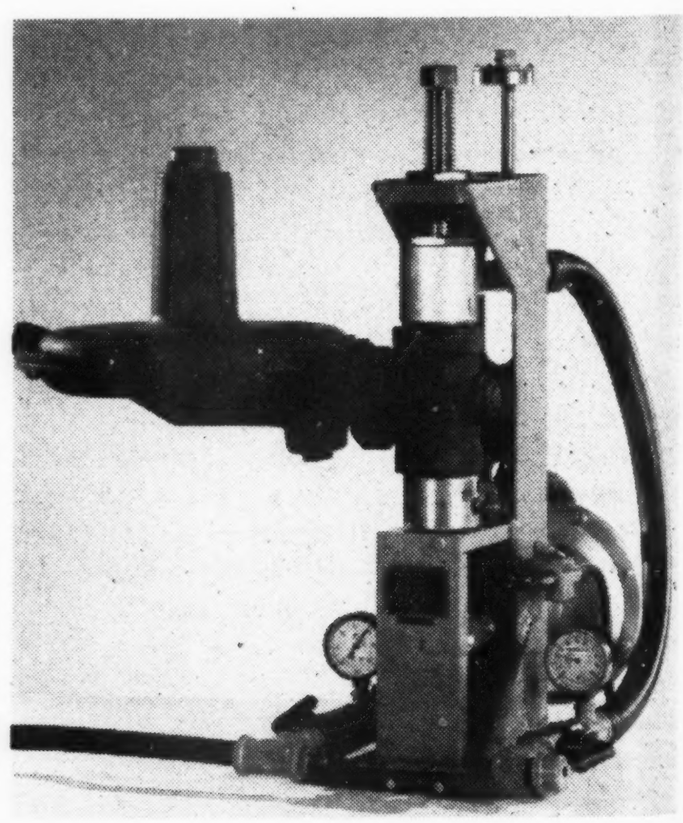
Repair and Test Stand

UNIVERSAL CONTROLS CORP., 731 W. Davis St., Dallas 8.

MODEL: Regulator repair and test stand.

APPLICATION: Developed to reduce the cost of repairing and testing regulators in gas company shops.

DESCRIPTION: This device first serves as a vise for solidly holding the regulator while



it is being repaired. Without removing it from the stand, the regulator may then be set for desired reduced pressure and tested for flow, lock-up, and leakage. Air pressure is used at about 20 psi to operate the clamping arrangement which locks the regulator body between rubber-faced jaws with a holding force of 2500 lb.

Adjusting screw permits setting the clamping blocks for any body face to face between 2½-in. minimum to 6¼-in. maximum.

Suitable for all regulators of service, appliance, and LP-Gas types up to and including 2-in. pipe size if body dimensions fall within these limits. Approximate height is 29 in., and the device will occupy bench space of 15 by 24 in. The stand is furnished with or without accessory equipment such as valves, hose, gauges, pipe fittings and orifice.

Cooking Range

BROWN STOVE WORKS INC., Cleveland, Tenn.

MODEL: 300 Series.

DESCRIPTION: This line includes five models with divided cooking top, aluminum alloy burner heads, stainless steel burner grates, and invididual porcelain enamel burner wells. The standard model is fully insulated, has automatic top lighting, 16 by

20-in. oven, and two giant and two regular burners. The interior is stippled porcelain and the broiler is located below the oven. Warming closet is full oven size, and the range has one roller bearing utility drawer.

The 300 Series is available with Waist-Hi broiler and separate oven and broiler burners, giving it two-oven capacity. Picture window oven door and apartment range are variations offered.

The line conforms with AGA specifications and is fully approved for LP-Gases.

CURRENT READING

The following four items are abstracts of papers presented at the annual meeting of the American Petroleum Institute in Chicago on Nov. 8-9.

THE IMPORTANCE OF NATURAL GAS in the National Economy, by R. H. Hargrove. Natural gas, as one of the three fuel industries, is of basic importance in the nation's economy today. The relationship of fuel consumption to national income indicates that our whole pattern of economic life depends for its very existence on an adequate and efficient fuel supply. The recent wartime peaks of energy consumption were a tremendous demand on the fuel industries. That demand was not met and satisfied without the expenditure of much effort and the cooperation of all three industries, viz., oil, coal, and natural gas, each of which contributed greatly to its resources.

But we must realize that our wartime energy peaks have already been surpassed in peacetime production, and we must look ahead to the possibility of still higher demands in the years to come. The author hopes that those energy peaks of the future will be the result of peacetime progress, but says we must take into account the effects on our economy in the event they should be due to the demands of war.

Looking to the future, therefore, and considering the position of the fuel industries, we can say that they, as public servants, have the duty and responsibility not only of supplying the peacetime demands of our nation for energy, but of supplying them in such a way that they may hold themselves ready to fulfill their part in national defense should the need arise. That means that the fuel industries as a group should cooperate in the various phases of their operations to meet today's needs and yet maintain a position which war would not too seriously disrupt.

It means, therefore, that the industries may have to broaden their viewpoints to the extent of sharing markets heretofore the province of one particular industry in order that the combined facilities of the fuel industries might be available in emergencies to serve the need adequately, rather than find a particular industry unable to cope with the situation alone. It may thus mean, today, the withdrawal from or de-emphasis of some types of markets by one industry in favor of

ARCCO
The World Over
wherever there is gas
ARCCO-ANUBIS
'Dry-Air GAS
GRAVITOMETERS
This new Arcco-Anubis Dry Air Gas Gravitometer determines and records specific gravity of gases automatically corrected to the humidity content of the air. The difference in weight between a column of GAS and equal column of DRY AIR is measured. This ratio represents the true specific gravity of the sample.
One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101.
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Made by General Electric Company for the American Meter Company ***(See latter's Catalogue AG-4).***

Attached to meters in following sizes:

20 10A Lt. American Meter
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Register and record gas consumption for 8-day period at half-hour intervals.

Available with or without meters

Write for further information to:

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SALES ENGINEER

Permanent position open for chemical engineer, age 25-35, in sales department of prominent organic chemicals manufacturer. Sales background and experience in measurement and distribution of natural gas are required. Considerable travelling involved.

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Los Angeles 4, Calif.

RATE CONSULTANT

Preferably graduate engineer, to develop rate structures for natural and manufactured gas; make studies of markets, competition and costs. Location New York; travel involved. Submit complete resume.

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EXPERIENCED GAS CONTROL SALESMAN

Permanent position with excellent opportunity open for man experienced in selling Gas Controls to gas appliance manufacturers and jobbers. Sales engineering background valuable, but experience in controls essential. Control line is complete for furnaces, water heaters, space heaters, and embodies outstanding advantages. Company is highly progressive, nationally famous for precision control products. Write, outlining experience, education and other personal details. Box 50, GAS, 198 S. Alvarado St., Los Angeles 4, Calif.

another—it may mean the sharing of markets in open competition.

There is actual competition in fuel marketing only in certain fields and areas. Competition is not possible sometimes on technical, and sometimes on economic, grounds. But in some localities we do find direct competition in some fields, as in the heating markets for our Appalachian and Eastern Seaboard areas. The picture of that competition shows a steady percentage increase in the consumption of oil and gas against a percentage decrease in coal consumption.

The reason for that situation in regard to gas is that gas, a superior fuel, is selling at a price that does not reflect its premium value, and which is often actually less than coal. This disparity in prices is due primarily to the effect of governmental regulation of gas prices, which does not allow the price of gas to seek its natural level in local competition. As a result of the price disparity, demand for natural gas has skyrocketed in recent years.

MECHANICAL ASPECTS OF PIPELINE COATINGS, by L. F. Scherer, The Texas Pipe Line Co., and O. C. Mudd, Shell Pipe Line Corp. To prevent corrosion is the prime reason for coating buried metal structures. All corrosion is electro-chemical action. The soils in which most metal structures are buried contain moisture or water with dissolved natural chemicals. In some locations these have been altered by absorption of fertilizers, industrial wastes and/or petroleum. Corrosion of metal by contact of soil proceeds only when the latter is moist. Corrosion can be prevented by insulating the metal from the moist soil or by nullifying the latter's electrolytic action.

The corrosion of underground pipelines has been observed ever since such were first laid, and many and varied steps have been taken to minimize its severity. In recent years industry has generally concluded that coating protection of some form should be provided on new pipeline installations; however, full consideration is seldom given all of the factors entering into the choice of proper coating materials.

These materials and their application have increased in cost to the point that the latter is a major item in the total cost of a new line. This factor, as well as their relative protective values, requires that every consideration, technical and economic, should be given their specification.

No practical pipe insulating material has been found which will stay completely stable and moisture-proof in the soil over an extended period. The economical alternative is to apply one which will remain reasonably stable under soil pressure and has a low moisture absorption rate, thus retaining an acceptable insulating value, and to compensate for its imperfections by applying cathodic protection. The latter's protective currents decompose any moisture (that may reach the pipe face) into gaseous components which escape through the coating flaws.

MAJOR SOURCES OF ENERGY, by Eugene Ayres, Gulf Research & Development Co., Pittsburgh. Our energy supplies are classified as to sources and uses, and present energy requirements are estimated. Nine "continuous" sources are analyzed. These, in the order of their magnitude, are solar energy, waterfalls, the earth's heat, vegetation, tropical waters, tides, atmospheric electricity, wind, and the heat pump.

The "unrenewable" sources of energy, including fissionable elements and fossil fuels, are considered for magnitude of reserves. The fuels are discussed with reference to efficiencies of conversion and of utilization. With various assumptions, predictions are made with regard to the life expectancy of our fossil fuel reserves.

ENVIRONMENTAL pH AS A FACTOR in Control of Anaerobic Bacterial Corrosion, by J. B. Hunter, H. F. McConomy, and R. F. Weston of The Atlantic Refining Co., Philadelphia. The results of the study reported in this paper indicate that control of the alkalinity of the soil adjacent to a pipeline could be used to inhibit anaerobic corrosion. It is shown in the paper that a high alkaline environment inactivates, but does not destroy, the sulfate-reducing bacteria which cause this corrosion. To prevent reactivation of the bacteria, an alkalinity greater than 9.0 to 9.5 pH must be maintained. Such control of the alkalinity of the soil might be accomplished in the field by electrical or chemical means.

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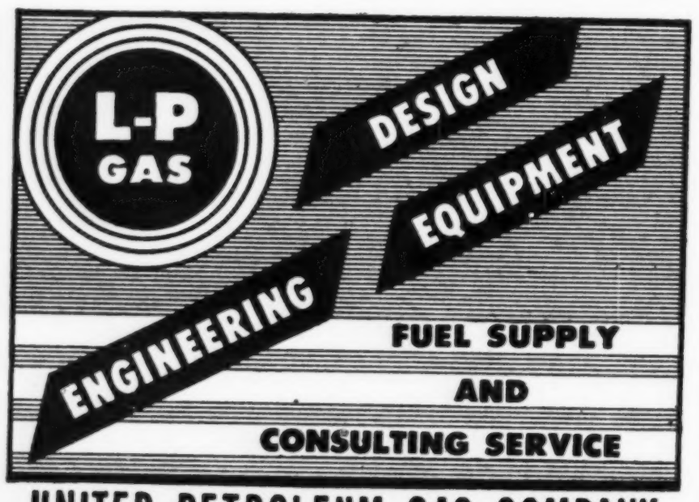

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CATALOGS

AMERICAN PETROLEUM INSTITUTE, 50 West 50th St., New York 20—Results of a survey of motion pictures and slide films suitable for employee training in petroleum and allied fields are incorporated in a catalog obtainable from the API at $3 a copy. The survey was conducted by Film Counselors of New York. Over 1300 motion pictures and slide films are reviewed, and source and availability are indicated. A source index and geographical list of film libraries are included, as well as suggestions for efficient use of films in training programs.

FARRIS ENGINEERING CORP., 489 Commercial Ave., Palisades Park, N. J.—Catalog 48 is a 72-page book which grew in the making until it is virtually a catalog and

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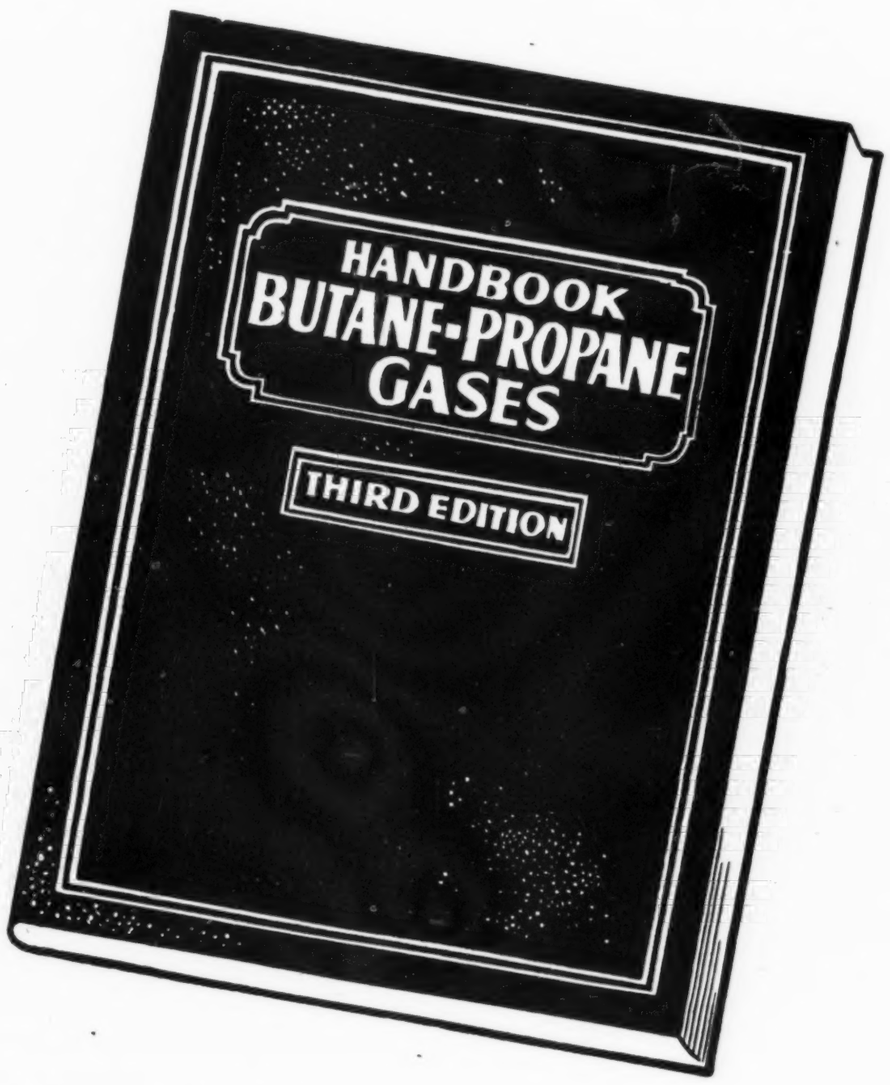

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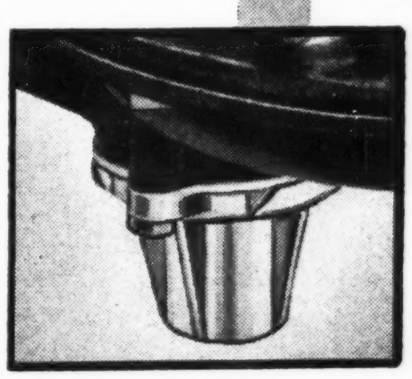

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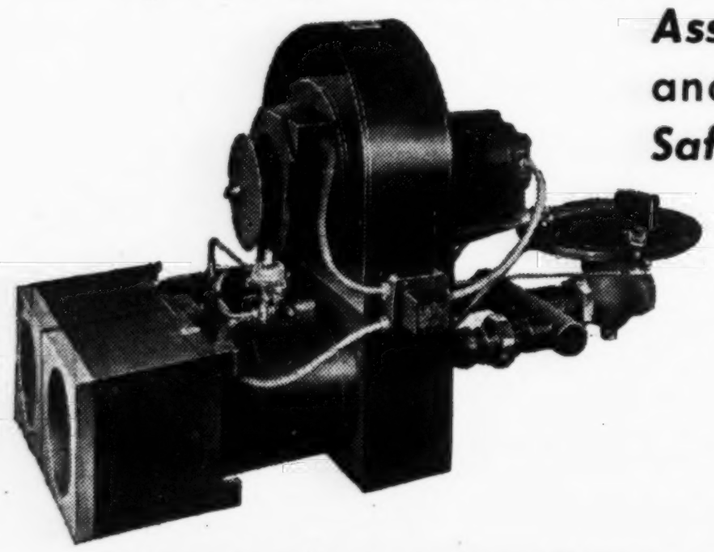

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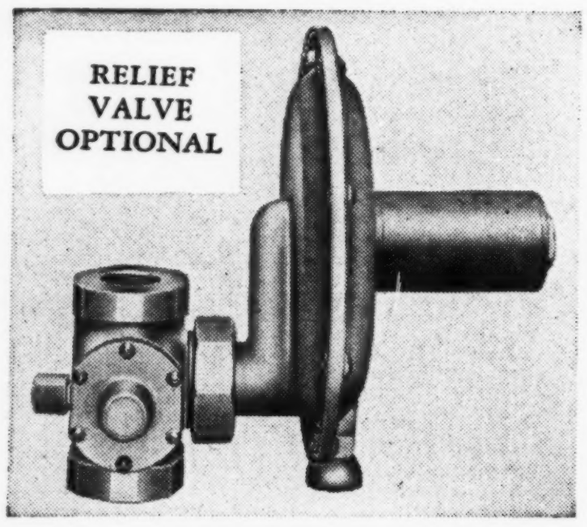

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data book on the subject of safety and relief valves. In addition to descriptions of various Farris valves for general and chemical corrosion resistant use, comparison and selection charts give a quick key to the proper valve for each type of service. Triple capacity tables give water, air, and steam capacities for various nozzle orifice sizes, and a new tight vapor sizing chart enables the valve user to size a valve quickly.

WARD HEATER CO., 1800 W. Washington Blvd., Los Angeles 7—Bulletin W-487, "Low-Cost Heating with the New Warco Furnace," lists complete specifications for this new line. Six advantages of Warco warmth are cited, and features of the furnace are pointed out in a cutaway photograph. All models in the line are expected to be available about Jan. 15. A supply of the four-page folders may be obtained from the company.

SCHUTTE & KOERTING CO., 12th and Thompson Sts., Philadelphia 22—Steam jet blowers and blast nozzles for moving large volumes of gas at low drafts are described in Bulletin 4-AB. Tables, charts and drawings give complete data on dimensions, connection sizes, capacities, and costs. Colored diagrams, with explanations, are used to illustrate typical applications of various types of blowers and blast nozzles.

WHITE-RODGERS ELECTRIC CO., 1209 Cass Ave., St. Louis, Mo.—Instruction sheet 2500-90 describes solenoid gas valves designed for use on gas-fired furnaces, boilers, unit heaters, floor furnaces, and central heating plants. The two-page bulletin deals with operation of the valve and of the safety pilot; manual operation, installation, wiring, and cleaning. A wiring diagram is included.

LEEDS & NORTHRUP CO., 4934 Stenton Ave., Philadelphia 44—A complete air-actuated control system is presented in catalog ND4B, "L&N Pneumatic Control." Diagrams and test curves show how this system provides proportional action, automatic droop-correction (reset), and stabilized rate action. A complete line of controllers, round chart or strip chart models, is presented.

PENN INDUSTRIAL INSTRUMENT CORP., 3116 N. 17th St., Philadelphia 32—Calatog 700, "Temperature and Pressure Recorders," describes and illustrates gas-filled recorders and recording pressure gauges. Details of bulb construction and pen arm movement are illustrated by photographs and line drawings. Tables give chart specifications.

HOMESTEAD VALVE MANUFACTURING CO., Coraopolis, Pa.—Section 5 of Valve Reference Book No. 39 has just been issued. It describes the Homestead-Reiser "Self-Seald" lubricated plug valve. General catalog data are offered, as well as descriptions, specifications, and prices on the units, parts, and accessories.

VICTOR EQUIPMENT CO., 844-54 Folsom St., San Francisco—Form 20B is a new catalog showing in four-color illustrations a representative portion of the Victor line of gas welding and flame cutting apparatus. A number of selection charts and specification tables are included in the 40-page bulletin.